FORECASTING FOREIGN CURRENCY EXCHANGE RATES FOR AIR FORCE BUDGETING

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Abstract

This thesis examines the current method of forecasting foreign currency exchange rates for the annual US Air Force budget. Using 5 methods against the status quo of a center-weighted average, the paper evaluates the absolute percent error (APE) over three time periods extending from Fiscal Year (FY) 1979 to FY 2014. The results strongly indicate that four of the alternative methods outperform the status quo over the shorter time period, and one method for all three time periods. Furthermore, a non-parametric comparison of the median APE demonstrates statistical similarities between the four methods over the short term, and allows for the Air Force to choose which method to exercise for future forecasting. Overall, the paper recommends using the settlement price of the average option contract in October to decrease the median APE by 3.475% and avoiding a $36 million opportunity cost.

Acknowledgments

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Nicholas R. Gardner

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FORECASTING FOREGIN CURRENCY EXCHANGE RATES FOR AIR FORCE BUDGETING

I. Introduction

The Department of Defense (DoD) obligates roughly $5 billion every year in 9 different foreign currencies[1] (Office of the Undersecretary of Defense (Comptroller), 2014). Foreign currency is necessary to pay for the daily operations, maintenance, construction and personnel costs of oversees bases and operations. As part of the federal budget process, the DoD must annually estimate the amount of foreign currency needed to fund these daily activities. Simply estimating $5 billion every year does not reflect realistic requirements. The Air Force (AF) is therefore seeking improvement in its foreign currency exchange rate forecasting methodology, which is the focus of this thesis. This chapter outlines the background of the DoD budget process and how the foreign currency exchange rate integrates into that process. It then defines the problem statement, research objective and focus, investigative questions, and assumptions. The chapter ends with a brief discussion on the methodology applied in the thesis.

Background

The DoD submits an annual budget to Congress to fund the investment and operation activities of the United States military. These activities represent approximately 18% of annual federal government outlays (or over half of discretionary spending (Office of Management and Budget, 2014)). For fiscal year 2013, the requested total obligation authority is $620 billion (Office of the Undersecretary of Defense (Comptroller), 2012).

[1] The currencies are Denmark's Krone, the European Union's Euro, Iceland's Krona, Japan's Yen, Norway's Krone, Singapore's Dollar, South Korea's Won, Turkey's Lira, and the United Kingdom's Pound.

As part of this budget submission, the DoD provides an estimate of required funding needed for expenses paid in foreign currencies. A specific account for absorbing foreign currency variability is also included and represents an opportunity cost to the DoD. Recent financial reports show an opportunity cost of $1.1 billion in 2013 and $1.4 billion in 2012 (Office of the Undersecretary of Defense (Comptroller), 2013). Over the course of 2013, the DoD's foreign exchange rate forecasts averaged a 9.61% difference from the actual average exchange rate. This gives a $105.7 million opportunity. Thus, small improvement can have significant impacts. For example, by deriving a new foreign currency estimating methodology that results in a narrowing of the difference by just 1% to 8.61%, the DoD can free an additional $10.6 million of budgetary authority.

Prior to 2005, the DoD formulated the budget's foreign exchange rates by selecting the most favorable rate observed in the months preceding the annual budget submission (Government Accountability Office, 2005). The most favorable rate provided the highest amount of foreign currency per dollar, and did not provide a realistic assessment of funding requirements. A Government Accountability Office (GAO) investigation in 2005 guided the DoD exchange rate forecasting process into a more rigorous statistical methodology excluding subjective judgment in picking the most favorable exchange rate. Since the 2005 report, the DoD has used a centered weighted average technique to estimating, resulting in more accurate forecasting in choosing exchange rates.

An austere budget environment (e.g. sequestration) forces the DoD to evaluate the opportunity cost of the current forecasting method. New research and data may provide a more precise formula for minimizing the difference between predicted and actual rates.

A shadow, though, is cast over the entire field by a seminal paper in 1983 (Meese & Rogoff, 1983). An examination of empirical exchange rate models of the 1970s did not fit out-of-sample data any better than a Random Walk model, and subsequent papers in the 1990's and 2000's seem to carry this claim (Moosa, 2013). The debate is not over, though, as some researchers find opportunities in measuring success through different avenues than out-of-sample testing (Engel, Mark, & West, 2007).

Problem Statement

This thesis aims to develop an unbiased forecast methodology, free from the estimator's subjective judgments, with the least variance between predicted currency exchange rates and actual currency exchange rates.

Research Objectives/Questions/Hypotheses

The following objectives guide this thesis. The thesis will perform a general survey of applicable forecasting methodologies, remove any methodologies based on unrealistic assumptions or an analyst's bias, and compare the methodologies by their variance of predicted opposed to actual exchange rates given a sample data set. In order to not repeat the mistakes identified in the GAO report (Government Accountability Office, 2005), special attention is given to minimizing subjective influence or biases in the methodologies.

The purpose of the research is to answer three questions:

- Which is the best method for the Air Force to apply in formulating a budget rate of foreign exchange in terms of variance?

- Which is the best method for the Air Force to apply in formulating a budget rate of foreign exchange in terms of simplicity?
- What is the probability that a given method will budget too little and require funds from the Foreign Currency Fluctuation account?

Research Focus

The focus of this research is on current forecast estimating methodology. The thesis reviews variables used in forecasting, assumptions in forecasting, and how to measure the variance between predicted and actual exchange rates. The forecasting period is from fiscal year (FY) 1979 to FY2014 divided into three separate time frames based on the available methods (FY79-FY12, FY91-FY12, and FY06-FY14).

Methodology

The thesis used a statistics based approach to compare the projected exchange rates to the actual exchange rate. The statistics based approach focuses mainly on variance and the measure of the margin of error between projected and actual exchange rates. The different methodologies derived from the literature forecasted a budgeted exchange rate and was compared to the actual exchange rate as reported in either the FRB H.10 average monthly exchange rate for the longer time period, or the USD(C) adjusting rates for the more recent time period.

Assumptions/Limitations

The foremost assumption in the thesis is that past behavior influences future behavior. In theory, an exchange rate can range from zero to infinity; however, the day-

to-day exchange rates do not vary by such wide scales. Furthermore, while the exchange rates are discrete and positive, the percent change from day-to-day is continuous, can be positive or negative, and may have a bell-curve distribution around a mean of zero. Continuous data and a bell-curve distribution lead to assuming the change in exchange rates, as a percentage, is normally distributed. Another assumption is the varying exchange rates within a day. The thesis simplifies the intraday variability by assuming one exchange rate for the day, as given by the Federal Reserve Foreign Exchange Rate – H.10 data.

The nature of forecasting and the DoD budget process guide limitations to this thesis. Forecasting can be notoriously difficult due to unforeseen circumstances, rare events, and small disturbances with oversized impacts (think of the waves from a stone dropped into a pond). These difficulties are compounded by limitations in data. More than one rate exists for exchanging currencies depending on the location, time, and bank. The thesis, therefore, limits itself to the Federal Reserve Foreign Exchange Rate – H.10. Process limitations arise in how the DoD budgets for the foreign currency fluctuation account. The budget contains only one rate per currency, while the actual exchange rate varies according to the market. The thesis limits the exchange rate to a daily rate as reported in the Federal Reserve Foreign Exchange Rate – H.10.

Implications

Given the average error in 2013, the size of the opportunity is $105.7 million. While finding a perfect forecast model is implausible, a 1% increase in accuracy could allow for more realistic budgets. Furthermore, the GAO investigated and found past

methodologies lacking in scientific rigor or too reliant on the analyst's subjectivity (Government Accountability Office, 2005). This thesis adds to the robustness of the DoD's forecasting process. Lastly, the successful narrowing of variance between a projected and actual exchange rate may allow for opportunities to effectively use limited resources in an era of declining budgets.

Summary

This chapter outlined the background of the DoD budget for foreign currency exchange. While not a significant portion of the overall DoD budget, the magnitude of foreign currency expenses and estimating represent an area to investigate with clear impact on the budget. After defining the problem statement, research objective and focus, investigative questions, methodology, limitations, and assumptions, the chapter ended with a brief discussion on the implications of the research to include the size of the opportunity, proper governance and robustness of DoD budgets, and the more efficient use of limited resources in an era of declining budgets.

The remaining sections of this thesis explore the topic in greater detail. After reviewing basic DoD budget processes, Chapter Two reviews the literature of private firm foreign currency mitigation techniques, forecasting, economic forecasting, and foreign currency exchange forecasting. Chapter Three explains the specific procedure in comparing the different methodologies and the data compiled for analysis. Results are given in chapter four giving way to a conclusion in chapter five. The conclusion synthesizes the accomplished work and recommends a course of action for the Air Force.

II. Literature Review

While precisely forecasting future exchange rates is unattainable, understanding the federal budget process, forecasting techniques and previous exchange rate research mitigates the magnitude of error in forecasting the budgeted exchange rate. The following section explains the federal budget process along with the DoD's foreign currency role in the budget process. Private, international firms must also confront exchange rate volatility. A review of private firm mitigating actions against foreign currency fluctuation provides insight into options for the DoD. The section then gives a framework of basic forecasting. Next, economic forecasting is defined before exploring current research on foreign currency exchange rate forecasting in business and the DoD. The chapter ends with a review of the main points of the federal budget process, forecasting, economic forecasting, and the DoD's efforts at forecasting foreign currency exchange rates.

The Federal Budget Process

The federal government receives tariffs, taxes, fees, and other collections throughout the fiscal year (1 October – 30 September). The executive branch obtains most of the collections for the federal government (e.g. the IRS is in the executive branch) while the legislative branch, Congress, defines the amount and activities to receive funding. The executive branch must formally request the funding and authority to use the collections from Congress through the budget process. The term "budget" is defined as the President's Budget. It is the financial plan for prioritizing and allocating resources due every February to Congress and accounts for all government agency

requirements for the next fiscal year (Office of Management and Budget, 2013). Policy guides the budget as policy dictates requirements for funding.

Figure 1 presents a representative decision tree of choosing a policy and its associated budget (B_i) with the uncertainty of requesting enough or too little funding. Ex ante, the executive branch provides a budget estimate according to the current policy (e.g. in ex ante the DoD forecasts the foreign currency exchange rate). Ex post is after the uncertainty of the true budget requirement is known. The sum of the probability of budgeting enough (P) and budgeting too little (1-P) is 1. The liquidation of the budget (L_i) provides the basis from which to judge whether the budget is enough ($B_i \geq L_i$). In terms of public finance, a recoup is when the executive branch asked for too much funding while a payout requires addition funding from Congress or a transfer from other appropriations. With respect to foreign currency, the goal is to minimize B_i-L_i and L_i-B_i.

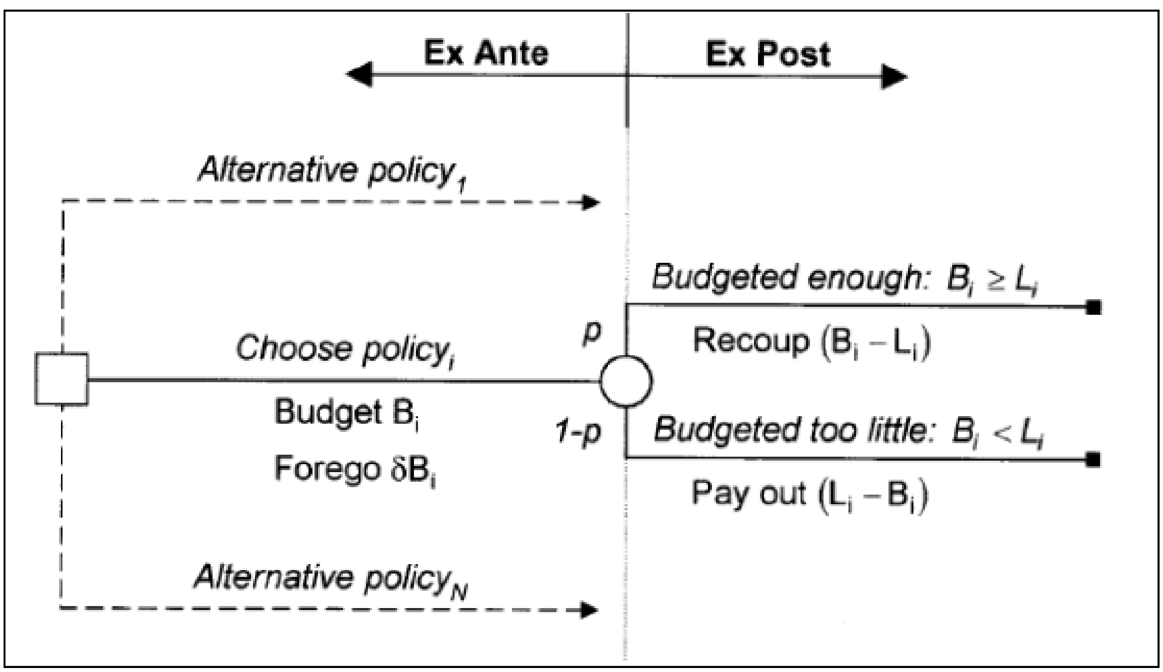

Figure 1 Decision Tree for Choosing a Budget (Groshek and Felli, 2000)

The entire Federal budget process encompasses three main phases: formulation, congressional deliberation, and execution (liquidation) (Office of Management and Budget, 2013). Foreign currency exchange rates affect the formulation and execution phases. DoD analysts forecast foreign currency exchange rates in the months preceding the budget submission during the formulation phase. Along with the other forecasted defense requirements, the DoD incorporates the forecasted exchange rates into a Budget Estimate Submission (BES). The Office of Management and Budget (OMB) integrates the BES along with the other federal agency budget estimates (e.g. the Department of Justice (DoJ) and the Department of Energy (DoE)). Budget estimates primarily focus on the budget year but also include the 9 years following the budget year (outyears) (Office of Management and Budget, 2013). Figure 2 represents the budget formulation in chronological order from the federal agency budget submission to the President's Budget.

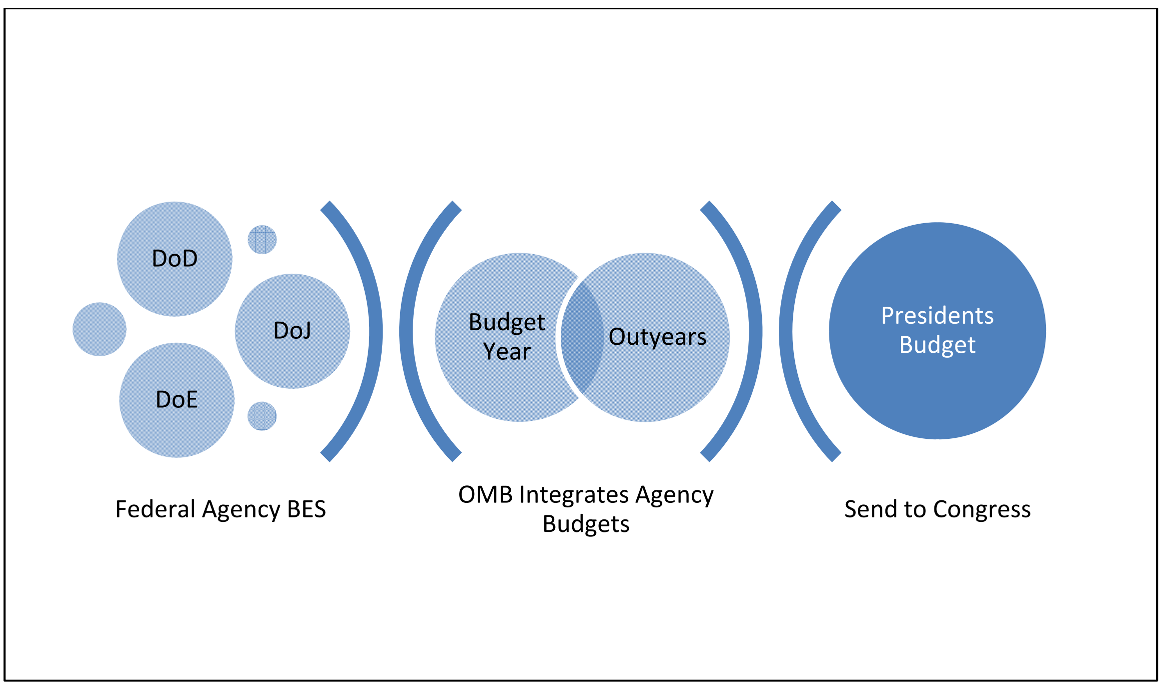

Figure 2 Budget Formulation Process

Congressional deliberation begins after receiving the President's Budget on the first Monday in February (Office of Management and Budget, 2013). The House of Representatives and the Senate deliberate separately on budget proposals. Each branch's appropriation committee reviews the BES's and calls for hearings from the federal agencies. The method of forecasting foreign currency plays an important role at this juncture, since previous inaccurate forecasts cast doubt about the cost of requirements in the budget estimate. The committees call conferences to adjudicate difference in the House and Senate committee recommendations before passing the authorization and appropriation bills. The authorization bill gives legal justification to obligate the federal government for sanctioned programs while the appropriations bill supplies funding to execute those programs (The Judge Advocate General's Legal Center and School, 2014). The President then signs the bills into law.

The execution phase follows the fiscal year beginning on 1 October and ending on 30 September. The forecasted exchange rates, then, are almost one year old by the time the fiscal year begins. During execution, each military department records foreign currency obligations at the budgeted rate. DoD's accounting office, Defense Finance and Accounting Service (DFAS), collects each military department's foreign currency obligations and compares the US dollar equivalent amount using the budgeted rate and the actual rate. The difference between the actual US dollar amount obligated and the budgeted dollar amount is the accrued variance (Department of Defense, 2011). DFAS then projects the variance to the end of the fiscal year (30 September) to analyze any significant variance for the remainder of the execution phase. Funding is transferred from the DoD's foreign currency fluctuation allotment to the military department (i.e.

Army, Navy, AF) by DFAS should the monthly report show a negative balance. With less variance, the DoD can lower the amount of funding required for the foreign currency fluctuation allotment. Better forecasting techniques helps the DoD lower the variance, and hence lowering opportunity cost by requiring less funding in a holding account.

Private Firm Foreign Exchange Rate Exposure Mitigation

The federal budget process neither flows flawlessly from one step to the next, nor is the objectives of all the stakeholders the same. Investing public dollars rests on analysis that is not solely based on monetary standards. Some examples of non-monetary standards include the benefits of sidewalk beautification projects or avoiding conflict through deterrence. Private firms, in contrast, normally quantify their investments in terms of present worth or the rate of return (Eschenbach, 2010). Table 1 highlights differences between public and private sectors. A closer review of private sector methods provides additional insights for DoD foreign currency forecasting.

Table 1 Differences in Investments Public and Private Sectors (Eschenbach, 2011)

Factor	Public Sector	Private Sector
Data	Benefits must be 1. Quantified and 2. Equated to money	Most benefits are monetary
Probability	Rare events often crucial (1 chance in 100 to 1 in a billion)	1 chance in 10 often the limit
Objectives	Multiple	Maximize present worth or rate of return
Stakeholders' Perspectives	Often conflicting	All want successful firm
Interest Rate	Complicated by nonmonetary benefits	Derived as an opportunity cost or from cost of borrowing

Private firms face the same exposure to foreign currency fluctuations as the DoD but they have more options to mitigate the risk of an unfavorable rate. Globalization and

open markets enables private firms to seek new markets, raw materials, production centers, warehousing, and other supply chain functions in various countries and currencies. Dispersing supply chain functions across countries increases the risk of unfavorable exchange rate changes through transaction and operation exposure (Bodnar, 2014). Increasing forecasting accuracy is also an option when firms cannot mitigate risk through transaction or operation exposures.

Transaction exposure is the exchange rate risk a contract possesses over a well-defined and relatively short time horizon. Firms mitigate the exposure through the use of forward contracts, future contracts, money market hedge, and options (Bodnar, 2014). Forward contracts and future contracts operate in a similar manner; a firm enters an agreement that specifies a price and date at which it can buy a fixed amount of foreign currency. Futures contracts differ in that they are exchange traded requiring initial collateral. Money market hedges use a forward contract to determine the present value of the foreign currency obligation in the home country currency to reduce exchange risk. Lastly, currency options provide the owner the right to buy a currency at a specific quantity, price, and date for an upfront fee.

Operations exposure is the exchange rate fluctuation impact on a firm's business model. While transaction exposure concerns contract instruments, operations exposure focuses on marketing, product pricing, supply chains, and production (Bodnar, 2014). A firm can choose which market to sell in depending on the exchange rate as well as adjust pricing and promotional strategies to offset short term exchange rate fluctuations. For longer term exchange rate fluctuations, a firm may choose to diversify sources of inputs (i.e. the supply chain) in order to manage costs. Locating plants and other production

resources in various countries also allows flexibility in choosing to manufacture product in low cost areas. The mix of production at those locations can then change according to currency fluctuations as needed.

Private firms can choose from a plethora of options; most of the options available to private firms do not apply to the DoD. Currency options and the use of derivatives are prohibited by law (Groshek and Felli, 2000). Appropriations must be obligated in the year of execution for current requirements in order to satisfy the bona fide needs rule (The Judge Advocate General's Legal Center and School, 2014). This precludes the DoD from purchasing options contract during budget formulation. The DoD may use forward contracts because the DoD does not obligate funding until the time of purchase. Furthermore, stakeholders outside of the DoD control the ability to locate military bases. National priorities, international alliances, and strategic importance outweigh the cost efficiency of locating military bases. Congress, the President, and the State Department influence these decisions alongside DoD recommendations. The lack of available exchange rate mitigation options directs the DoD to employ exchange rate forecasts.

Forecasting

One must understand the elements of forecasting in order to help lower variance between the budgeted exchange rate and the actual exchange rate. In general, forecasting is notoriously complex. A survey on forecasting research uncovered 139 principles in 16 categories (Armstrong, 2001). Forecasting techniques can be subdivided into three categories as shown in Table 2. Forecasting foreign currency exchange rates focus on quantitative methods. Quantitative forecasting requires numerical information about

historical data that one can assume will continue a pattern into the future (Makridakis et al., 1998).

Table 2 Categories of Forecasting Methods and Examples of Their Application (Makridakis et al. , 1998)

Forecasting Method	*Explanation* and Example
Quantitative	*Sufficient quantitative data exists* Time Series: continuation of historical patterns Explanatory: Understanding the effects of independent variables
Qualitative	*Little or no quantitative information is available, but sufficient qualitative knowledge exists* Predicting the speed of telecommunications are the year 2036
Unpredictable	*Little or no information is available* Predicting the effects of interplanetary travel

Generally, the forecasting task can be divided into five areas: formulating the problem, collecting data, selecting methodology, evaluating methodology, and using the forecast.

Formulating a problem requires understanding the need for a forecast and the involvement of responsible parties. A forecast's necessity derives from the effect the forecast will have on a decision; one should not forecast if the result will not change a decision. Responsible parties ultimately control the decision and must be updated with forecasting results to guide the decision making process.

An understanding of the problem at the beginning directs the type of data required for analysis. Theory guides the search for explanatory variables and may uncover analogous studies. Data, though, must be unbiased and should come from sources without a vested interest in the forecast's outcome. Other sources of error can come from the procedures used to collect the data as well as measurement error from the instruments (for foreign currency an example of measurement error using only one exchange rate per

day when the rate really floats throughout the trading period). After collecting the data, a formal process removes defects (i.e. erroneous observations) and transforms the data into a useful medium of analysis. Transforming data may be as simple as transcribing paperwork into a digital format or more complex like converting rates into a logarithmic function. Another adjustment prevalent in economics is the seasonality at the time of collection (e.g. seasonally adjusted unemployment figures). Analysts should adjust data according to empirical evidence of seasonality to reduce error in the data (Makridakis et al., 1998).

The type of data collected and purpose of the forecast guide methodology selection. At this point in forecasting, understanding the problem should have led to hypothesized causal relationships. The possible causal relationships inform the analyst of the data required and appropriate methodology for the investigation. The chosen method, or methods, ability to influence the decision at hand must also be considered and communicated to the decision maker. Generally, the use of a simple method is preferred unless prior research identified a more accurate complex method (Allen and Fildes, 2001). Quantitative methods are also generally preferred as they reduce the bias in analysis. If the problem has high uncertainty and questionable data, a qualitative judgmental method may be applied (such as expert opinion or surveys). Incorporating both quantitative and judgmental methods can further assist in weighing data according to importance or selecting quantitative methods. Finally, combining more than one method integrates information and reduces the risk of bias from using a particular method.

After method selection, an evaluation reviews the risks and uncertainty within the process. The analyst should test the assumptions of each method to confirm the validity

of the method to the data and the problem. An independent observer should review the methodology and agree with its logic. If using more than one method, the analyst should compare the results of each method to measure the error between each method. Different scales of measurement as well as outliers affect variability in the results of one method as opposed to the other.

Using forecasts is the final step. After completing the previous steps, the analyst should present findings in a format tailored to the decision maker. Assumptions, data, and methods must be clearly presented to reduce the appearance of bias and give confidence in the forecast. Using the forecast on a regular basis allows the analyst to learn how to improve the forecast. Assimilating the improvements, an analyst can improve the forecast and reduce variability.

Economic Forecasting

What works in an experimental setting (holding all other variables constant beyond the independent variables) can produce failures when applied to real world situations (Meese and Rogoff, 1983). While it is known as the "dismal science," economics gives insights into the allocation of limited resources such as time and money. Forecasting, then, is a natural fit in economics as firms want to maximize the use of their limited resources.

Economists began using forecasting as the combination of statistical analysis and economic theory (Allen and Fildes, 2001). The main principle is to use a simple model to describe the relationship between dependent variables and a relatively small set of independent variables. The favored test regarding the usefulness of a simple model is

whether the model can predict relatively accurate results with out-of-sample data (data not used in formulating the model). Testing with out-of-sample data may not give the "true" model, since any simplified model derived from a data set is a misspecification of the data. Estimating the causal independent variables induces prediction error, even with a data set created with known variables and estimated parameters (Gilbert, 1995). Another test is not how well the model predicts the dependent variable but in predicting when the dependent variable will change from growth to decline or decline to growth (Engel et al., 2007). With that said the standard remains out-of-sample validity of the model's predictions since this thesis is interested in predicting a budget rate and not the timing of foreign currency exchange rate increases or decreases in value against the US dollar.

Economists generally use a regression model to predict the dependent variable (Allen and Fildes, 2001). The use of Vector Auto Regression (VAR) and Error Correcting Models (ECM) are prominent in economics. VAR uses economic theory to narrow the number of independent variables required for predicting a dependent variable. VAR then measures the interdependencies of the independent variables to the dependent variables across a time series (a sequence of data points in temporal order). ECM ascertains a dependent variable's equilibrium value and estimates the rate at which the dependent variable returns to equilibrium through the influence of independent variables. The equilibrium can be a value or the rate at which the dependent variable changes (a vector). Both models assume constancy of exogenous variables throughout the time series and are limited by the data provided in formulating the model (in-sample data). These two models contain subsets for particular areas within economics. The focus of

this research is for foreign currency exchange rate forecasting and will focus on models pertaining to that subset.

Foreign Currency Exchange Rate Forecasting

The Meese and Rogoff paper casts a shadow over the ability to predict exchange rates as tested against out-of-sample data. They found the Random Walk model (the dependent variable is a function of the last observation plus an error term) performs no worse than the univariate time series models, unconstrained VAR, or candidate structural models in forecasting real exchange rates (Meese and Rogoff, 1983). The paper states the last known observation is just as likely a predictor of future values as using other independent variables. Their conclusion demonstrated the impracticality of using independent variables based on money supply, demand, and commodity prices to predict exchange rates. The findings from 1983 still hold true as forecasts based on ex ante (before the exchange rate is set) expected changes perform poorly (Evans and Lyons, 2005). Some have suggested the use of the root mean square error (RMSE) to measure forecasting accuracy is incorrect, but measuring by time-varying coefficients with the same data do not over turn Meese and Rogoff's conclusion (Moosa and Burns, 2014).

Judging forecast methodology through other means than the actual value against predicted value leads to different conclusions about the effectiveness of exchange rate forecast models. Moosa and Burns demonstrate that a few models outperform the Random Walk when measuring forecast accuracy in terms of rate direction and in terms of profitability (Moosa and Burns, 2014). Engel, Mark, and West emphasize the Random Walk benchmark is improper as models should have low predictive power of this type

(Engel et al., 2007). They further state models incorporating news about macroeconomic fundamentals (for example GDP growth) may well account for observed exchange rate volatility. Lastly, the authors use expected present values from survey forecasts and demonstrate an increase of out-of-sample forecasting power through panel estimation and long-horizon forecasts. New forecasting methods also increase the accuracy of modeling. The short-horizon predictive ability, using Bayesian model averaging, shows large gains over the Random Walk benchmark (Corte et al., 2008). Artificial neural networks (self-learning algorithms trained on historical data) show robust exchange rate predictions in midst of outliers (Majhi et al., 2012). The results of the above research lead to the possibility of positive results compared to the Meese and Rogoff original study.

Auction theory provides another method of forecasting exchange rates. The international exchange market for currencies acts as an auction, and the future options on currencies may give insight into forecasting the exchange rate. If there are many traders for the currency, the option market can aggregate each trader's estimated price on the underlying asset (Psendorfer and Swinkels, 2000). The option price then acts as a signal of the market's approximation for the currency's future exchange rate. If the options price mirrors the actual exchange rate well enough, it may be possible to use the options price as the budgeted rate in the DoD budget.

Foreign Currency Exchange Rate Forecasting in the DoD

In fiscal year 1979, Congress authorized an appropriation for the DoD to establish a centrally managed allotment (CMA) to alleviate the adverse effect of significant currency fluctuations in authorized operations and maintenance (O&M) and military

personnel appropriations (Department of Defense, 2011). The Foreign Currency Fluctuations, Defense (FCF, D) account provided the control structure to account for all transfers of net gains and losses incurred throughout the execution year. In fiscal year 1987, Congress authorized an additional appropriation, Foreign Currency Fluctuations, Construction, Defense (FCF, C, D), for the family housing and military construction appropriations. Prior to the FCF, D and FCF, C, D, the DoD could not use the additional budget authority from previous high estimates to cover the cost of current deficits. Current deficits would require transferring funding from other programs or requesting additional funds from Congress.

In 1998, Gerald M. Groshek and James C Felli of the Naval Postgraduate School examined two methods of reducing risk in the DoD to foreign currency fluctuations against the status quo (Groshek and Felli, 2000). The authors applied forward foreign exchange contracts and currency options against the naïve based approach (the status quo) from 1985 to 1998. Forward foreign exchange contracts allow the DoD to determine the required budgeted amount by applying forward rates to the estimated foreign amounts. The authors utilized Air Force O&M commitments as the budgeted amount in US dollars and Eurocurrency interest rates as the forward rates at the time of budget formulation. Under the currency options approach, the authors considered call options with an at-the-money forward strike prices. The naïve based approach simply picked an observed foreign exchange rate at some point in the budget formulation as the budgeted rate. Using the above methods, the DoD could expect a cost reduction of 3.5% of current outlays with forward contracts and 6.4% reduction using options with a 2.9% upper bound on option premiums (the premium is the cost of buying an option) over the

naïve approach. The authors recommend the forward contracts since the option contracts require authorization from Congress.

Fiscal law prohibits the use of authorized funding in time periods other than the stated period in the appropriation (The Judge Advocate General's Legal Center and School, 2014). Operations and maintenance (O&M) funding is available for one year only; the government can only incur obligations against the O&M appropriation from 1 October to 30 September of the year of appropriation. To use forward rates, the US Treasury must authorize the use of a forward contract as stated in volume 5 of the Financial Management Regulations (Department of Defense, 2011). The treasury would need to have a forward pricing rate agreement across fiscal years between the US government and the foreign government or private firm for the disbursement to be made at the rate determined by the forward rate method.

The GAO investigated the DoD's foreign currency forecasting methodology in 2005 (Government Accountability Office, 2005). Despite Groshek and Felli's findings, the DoD still used the naïve based approach by using an observed rate from the Wall Street Journal in the budget process. In 2005, the DoD changed methodologies to a statistical based approach after considering the method of forecasting applied in other federal agencies, a commercial company to forecast, and various statistical methods. The statistical method, center-weighted-average, allowed universal replication without subjective judgment (Secretary of the Air Force - Financial Management Directorate of Economics and Business Management, 2010). Based on historical and current data, the chosen statistical method weighted the five year average exchange rate with the exchange rate 12 months prior. Weights range from 0 to 1 with a weight of 0 implying a budgeted

rate equal to the rate 12 months previous. Excel's Solver optimizes the weights by minimizing the sum of squared errors (SSE) between forecasted and actual rates over the previous 60 months. By weighing each rate equally at the start, the process creates a forecast for each month over the previous 60 months and calculates the SSE. Solver then adjusts the weight and recalculates the SSE over the previous 60 months. The process is repeated until Solver discovers the minimum SSE. Lastly, the DoD reviews the forecasts for long term trends in developing the five year average (i.e. the Kuwaiti Dinar's pegging to a basket of currencies in May, 2007). The GAO approved of the center-weighted-average approach as it, "Provides a straightforward statistical calculation of historical data that can be easily replicated with no hidden assumptions and is not dependent on subjective judgment (Government Accountability Office, 2005)."

Another paper researched a future exchange rates predictor for the DoD in 2013 (Freund and O'Neal, 2013). The authors compared the center-weighted-average approach to five different models: moving average, prior year average, trend-lines, extending current rates, and a multivariate model. The moving average, prior year average and trend line incorporated historical exchange rates from 1, 3, 5, and 10 years in the past while extending the current rate used the recent 12 month average. The multivariate model incorporated historical exchange rate with economic factors to include historic gross domestic product (GDP), consumer price index (CPI), unemployment rates, and economically active population rates. Applying multiple regressions to account for covariance and statistical significance, the authors created a model for each currency exchange rate from the economic factors. The researchers compared all five models to the center-weighted-average by the mean squared error (MSE) between the forecasted

and actual exchange rates from 1999 to 2012. Of the five models, the one year prior year average produced the minimal MSE when used across all currencies. Each currency, though, possessed a best specific model (i.e. the three year trend line had the lowest MSE for the Euro and Denmark Kroner while the five year 10 year prior year average was best for the South Korean Won). The paper recommended using the one year prior year average for formulating the fiscal year 2015 budgeted rate.

Summary

This research aims to improve the DoD budgeting process for foreign exchange rates. Budget processes, timelines, and decision authority differ from standard business firm models, but the need for accurately forecasting future requirements remains. Fiscal law precludes the DoD from many of the strategies available for private firms to mitigate exposure to foreign currency fluctuations. Forecasting, although complicated, follows five basic steps: formulating the problem, collecting data, selecting methodology, evaluating methodology, and using the forecast. Economic forecasting is a subset of forecasting that has traditionally used theory to define independent variables capable of predicting dependent variables and measures the success by out-of-sample variance. For exchange rates, the literature revealed the forecasting potential of theoretical independent variables is no better than using a Random Walk model. Meese and Rogoff's conclusion has had lasting effects throughout the decades. Some researchers have chosen to frame the problem in a new light and use new statistical methods to forecast exchange rates. A few have shown promise over the short term using artificial neural networks, shortening the time frame for a forecast, or using a aggregation of surveys and future expectations.

Others still claim the Random Walk benchmark is improper as the models do explain some variability. From the above research foundation, a few chosen methodologies will be tested for use in the DoD environment. The DoD specific research offers a starting point from which to judge new methodologies.

III. Methodology

Chapter 3 seeks the optimum method to forecast foreign exchange rates for the DoD budget. The chapter begins by defining the data sources and the suitability of the data to predicting exchange rates for the DoD. The chapter then explains the six different methods (including status quo) before describing how those methodologies will be compared. A summary of the chapter briefly reviews the material covered in this chapter.

Data Sources

There are five sources of field data for this thesis: the Federal Reserve Foreign Exchange Rate – H.10, the Global Insight forecasts, the Chicago Mercantile Exchange (CME) as taken through the website Quandl, the adjusting rates of exchange from the USD, Comptroller, and the long term interest rates as reported by the Organization for Economic Co-operation and Development (OECD). The Federal Reserve Foreign Exchange Rate – H.10 is a weekly report providing the exchange rates in foreign currency units per U.S. dollar for each day of the previous week (Board of Governors of the Federal Reserve System, 2015). Table 3 is a sample of the report taken from the Federal Reserve Board's Economic Research & Data website. Because the Federal Reserve produces the report on a weekly basis, the data were combined into one spreadsheet. The Federal Reserve data are pertinent to the research, as the rates represent the spot rate used at the time of disbursement of funds from the DFAS.

Table 3 Sample H.10 Report on 15 Sep 2014

Release Date: September 15, 2014

Foreign Exchange Rates -- H.10 Weekly
(Rates in currency units per U.S. dollar except as noted)

COUNTRY	CURRENCY	Sep. 8	Sep. 9	Sep. 10	Sep. 11	Sep. 12
*AUSTRALIA	DOLLAR	0.9300	0.9207	0.9153	0.9115	0.9047
BRAZIL	REAL	2.2498	2.2825	2.2956	2.2882	2.3301
CANADA	DOLLAR	1.0933	1.1010	1.0954	1.1032	1.1075
CHINA, P.R.	YUAN	6.1400	6.1362	6.1284	6.1295	6.1344
DENMARK	KRONE	5.7492	5.7661	5.7660	5.7535	5.7446
*EMU MEMBERS	EURO	1.2948	1.2909	1.2908	1.2936	1.2955
HONG KONG	DOLLAR	7.7504	7.7502	7.7503	7.7505	7.7505
INDIA	RUPEE	60.2900	60.6000	60.9500	60.9300	60.9500
JAPAN	YEN	105.6500	106.3200	106.7600	106.8700	107.2400
MALAYSIA	RINGGIT	3.1730	3.1885	3.2000	3.1920	3.1960
MEXICO	PESO	13.0755	13.2040	13.2090	13.2120	13.2485
*NEW ZEALAND	DOLLAR	0.8285	0.8245	0.8245	0.8187	0.8156
NORWAY	KRONE	6.3123	6.3503	6.3509	6.3753	6.3617
SINGAPORE	DOLLAR	1.2564	1.2627	1.2626	1.2630	1.2631
SOUTH AFRICA	RAND	10.7780	10.9245	10.9265	10.9545	10.9930
SOUTH KOREA	WON	1024.0000	1034.0500	1034.2000	1035.9000	1034.9000
SRI LANKA	RUPEE	130.1800	130.1800	130.2000	130.2500	130.2500
SWEDEN	KRONA	7.0877	7.1136	7.0987	7.1179	7.1326
SWITZERLAND	FRANC	0.9317	0.9348	0.9382	0.9349	0.9337
TAIWAN	DOLLAR	29.9300	29.9700	30.0000	30.0200	30.0400
THAILAND	BAHT	32.0400	32.0900	32.1400	32.1900	32.2000
*UNITED KINGDOM	POUND	1.6141	1.6088	1.6134	1.6225	1.6243
VENEZUELA	BOLIVAR	6.2842	6.2842	6.2842	6.2842	6.2842
Memo:						
UNITED STATES	DOLLAR					
1) BROAD	JAN97=100	104.0397	104.5099	104.5065	104.5710	104.7427
2) MAJOR CURRENCY	MAR73=100	79.2266	79.6254	79.5726	79.6552	79.7607
3) OITP	JAN97=100	130.2691	130.8061	130.8657	130.9038	131.1510

ND = No data for this date.

For more information on exchange rate indexes for the U.S. dollar, see "Indexes of the Foreign Exchange Value of the Dollar," Federal Reserve Bulletin, 91:1 (Winter 2005), pp. 1-8 (http://www.federalreserve.gov/pubs/bulletin/2005/winter05_index.pdf). Weights for the broad index can be found at http://www.federalreserve.gov/releases/H10/Weights; weights for the major currencies index and the other important trading partners (OITP) index are derived from the broad index weights. The most recent annual revision of the currency weights and dollar indexes took effect with the May 2010 release of this report. The source for exchange rates not listed in the table above but used in the calculation of the broad and OITP indexes is Bloomberg L.P.

* U.S. dollars per currency unit.

The second set of data was produced by a private company, IHS Global Insight (IHS Inc, 2015). The DoD uses the company's materials price forecasts in developing cost estimates for procurement or operations and support (e.g. shipbuilding) (Horowitz et al., 2012). This company also provides an analysis service of how world economic events, trends, and developments affect businesses and countries to include forecasts of foreign exchange rates. Using past forecasts, this research compared the actual to

predicted exchange rates from the company. Forecasts from the company, though, do not provide insight into the company's methodology, which may not be sufficient for a GAO inquiry. Table 4 is an example of the 2004 fourth quarter forecast for the Japanese Yen per US dollar by quarter (highlighted) and annual forecast in Table 5.

Table 4 Global Insight Japanese Yen to US Dollar Quarterly Forecast

Table IQ6
Japan
(Fourth Quarter 2004 Forecast)
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	2004:2	2004:3	2004:4	2005:1	2005:2	2005:3	2005:4	2006:1	2006:2	2006:3	2006:4	2007:1	2007:2	2007:3	2007:4
Aggregate Indicators (1997=100)															
Consumer Price Index	97.5	97.6	97.5	97.5	97.6	97.7	97.8	98.1	98.3	98.7	99.1	99.4	99.8	100.3	100.7
%	-0.7	0.1	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.4
Producer Price Index	95.5	95.0	94.6	94.4	94.1	94.0	93.9	93.8	93.9	93.9	94.0	94.2	94.4	94.6	94.9
%	0.2	-0.5	-0.4	-0.3	-0.2	-0.2	-0.1	-0.1	0.0	0.1	0.1	0.2	0.2	0.3	0.3
Industrial Production	102.0	102.8	103.2	103.3	103.5	103.6	103.8	104.0	104.2	104.5	104.7	105.0	105.2	105.4	105.7
%	3.2	0.7	0.4	0.1	0.2	0.1	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2
U.S. Dollar Exchange Rate	109.7	107.1	104.2	102.8	101.9	100.9	100.0	99.1	98.5	98.1	97.8	97.7	97.5	97.3	96.9
%	2.4	-2.4	-2.6	-1.4	-0.8	-1.0	-0.9	-0.9	-0.6	-0.4	-0.3	-0.1	-0.2	-0.3	-0.3

Table 5 Global Insight Japanese Yen to US Dollar Annual Forecast

Table IA6
Japan
(Fourth Quarter 2004 Forecast)
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	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Aggregate Indicators (1997=100)													
Consumer Price Index	98.4	98.1	97.7	97.7	98.5	100.1	101.9	103.9	106.1	108.5	111.0	113.6	116.3
%	-0.9	-0.2	-0.5	0.0	0.9	1.6	1.8	2.0	2.1	2.2	2.3	2.3	2.4
Producer Price Index	95.7	95.0	95.1	94.1	93.9	94.5	95.7	97.1	98.8	100.6	102.4	104.1	105.8
%	-2.1	-0.8	0.1	-1.1	-0.2	0.7	1.3	1.5	1.7	1.9	1.8	1.6	1.6
Industrial Production	92.3	95.3	101.7	103.6	104.4	105.3	106.3	107.4	108.6	109.9	111.2	112.6	113.9
%	-1.3	3.3	6.8	1.8	0.8	0.9	0.9	1.0	1.1	1.2	1.2	1.2	1.2
U.S. Dollar Exchange Rate	125.2	115.9	107.1	101.4	98.4	97.3	95.9	94.4	93.1	92.2	91.5	91.0	90.8
%	3.0	-7.4	-7.7	-5.3	-3.0	-1.1	-1.5	-1.6	-1.4	-1.0	-0.8	-0.5	-0.3

The Quandl data contains daily futures prices on currencies from the CME. Table 6 gives an example of data containing the open, high, low, and settle prices for the contract as well as the volume of contracts traded and the bids amount of contracts available from the previous day. The futures contract prices differ according to time and contract expiration day. In order to create a historical futures series, the contracts must be combined into a continuous futures contract by combining. Combining the individual futures contracts (or 'rolling' the contracts) can follow different rules depending on the analysis. Economic forecasting uses the "first day of month" and "calendar-weighted

rolling" rules. The "first day of month" roll method combines futures on the first day of the contract delivery month or on the contract end date, whichever is sooner (Quandl, 2015). The "calendar-weighted rolling" is a price adjustment to negate the discontinuities in contract prices of the successive underlying futures contracts. The method allows for transitioning from one contract to the next over 5 days where the first contract is weighed 100% on day 1 and 0% on day 5. The opposite is true for the second contract. The percent shifts by 20% each day between the first and second contract. Using the "first day of month" and "calendar-weighted rolling rules" provides a continuous data set for analysis. This research used the average of daily settlement prices to forecast exchange rates.

Table 6 Example of Euro Futures Data Pulled from Quandl

Date	Open	High	Low	Settle	Volume	Prev. Day Open Interest
2014-11-06	1.248	1.2537	1.2376	1.239	346745	457437
2014-11-05	1.2553	1.2571	1.246	1.2483	250553	456281
2014-11-04	1.2492	1.2581	1.2491	1.256	217552	452793
2014-11-03	1.2515	1.2515	1.2442	1.2494	224986	452251
2014-10-31	1.2616	1.2619	1.2489	1.253	355317	443446
2014-10-30	1.2639	1.2643	1.2548	1.2616	248190	437202
2014-10-29	1.2737	1.2775	1.2636	1.2649	190485	434187
2014-10-28	1.2702	1.2769	1.2688	1.2739	176909	435325
2014-10-27	1.2677	1.2727	1.2669	1.2712	142141	435029
2014-10-24	1.265	1.27	1.2638	1.2668	145110	438942
2014-10-23	1.265	1.268	1.2617	1.2653	168530	439199
2014-10-22	1.2717	1.2744	1.2641	1.2648	205927	433426

Adjusting exchange rates are published monthly on the USD Comptroller website (Office of the Undersecretary of Defense (Comptroller), 2014). The publication lists the budgeted rate for the fiscal year in question along with the monthly foreign currency rate as the adjusting rate. The budgeted rate column provides the status quo estimate and the adjusting rate column provides the actual rates for the study period between FY06 to

FY14. The adjusting rate serves as the actual rate in calculating the error for all the methodologies in the FY06-FY14 time period. For the longer periods (FY79-FY12) the arithmetic mean of daily exchange rates form the FRB H.10 report supply the adjusting rates. Appendix F demonstrates the adjusting rates from the monthly USD currency fluctuation publication and the H.10 average monthly rates are statistically the same. Table 7 below is an example of the USD monthly report on currency fluctuations.

Table 7 USD Comptroller Monthly Report on Currency Fluctuations

ADJUSTING RATES OF EXCHANGE FOR "FOREIGN CURRENCY FLUCTUATIONS, DEFENSE," "FOREIGN CURRENCY FLUCTUATIONS, CONSTRUCTION" AND "DEFENSE MILITARY CONSTRUCTION AND FAMILY HOUSING"
For Month Ended 9/30/04

		O&M (DOD) FY 2004 BUDGET RATE		MILCON & FH FY 2004 BUDGET RATE		ADJUSTING RATE **	
COUNTRY	MONETARY UNIT	U.S. DOLLARS FOR ONE UNIT OF FOREIGN CURRENCY	UNITS OF FOREIGN CURRENCY FOR ONE U.S. DOLLAR	U.S. DOLLARS FOR ONE UNIT OF FOREIGN CURRENCY	UNITS OF FOREIGN CURRENCY FOR ONE U.S. DOLLAR	ADJUSTING RATE (IN U.S. DOLLARS)	ADJUSTING RATE (IN FOREIGN CURRENCY)
BELGIUM	FRANC	0.0240346	41.6066	0.0240346	41.6066		
DENMARK	KRONE	0.1282117	7.7996	0.1282117	7.7996	0.1670007	5.9880
EUROPEAN UNION*	EURO	0.9695559	1.0314	0.9695559	1.0314	1.2436264	0.8041
FRANCE	FRANC	0.1478087	6.7655	0.1478087	6.7655		
GERMANY	DEUTSCHE MARK	0.4957367	2.0172	0.4957367	2.0172		
GREECE	DRACHMA	0.0028454	351.4496	0.0028454	351.4496		
ITALY	LIRA	0.0005007	1,997.0690	0.0005007	1,997.0690		
JAPAN	YEN	0.0079688	125.4900	0.0079688	125.4900	0.0090901	110.0100
NETHERLANDS	GUILDER	0.4399666	2.2729	0.4399666	2.2729		
NORWAY	KRONE	0.1309003	7.6394	0.1309003	7.6394	0.1490002	6.7114
PORTUGAL	ESCUDO	0.0048361	206.7771	0.0048361	206.7771		
SINGAPORE	DOLLAR	0.5544159	1.8037	0.5544159	1.8037	0.5936127	1.6846
SOUTH KOREA	WON	0.0007968	1,255.0000	0.0007968	1,255.0000	0.0008684	1,151.5400
SPAIN	PESETA	0.0058271	171.6105	0.0058271	171.6105		
TURKEY	LIRA	0.0000006	1,694,915.0000	0.0000006	1,694,915.0000	0.0000007	1,492,537.0000
UNITED KINGDOM	POUND	1.5344484	0.6517	1.5344484	0.6517	1.8122508	0.5518

* On January 1, 1999, the euro became the official currency of 11 member states of the European Union with a fixed conversion rate against their national currencies. The euro was adopted by Greece on January 1, 2001. The value of the euro fluctuates according to market conditions against the dollar and all other currencies. Euro notes and coins were introduced to replace national notes and coins on January 1, 2002. The above foreign currency budget rates are based on PBD 660, dated December 9, 2002.
**Adjusting exchange rates for the individual euro-area currencies are no longer provided. Use the fixed conversion rates as follows: 1 Euro = 40.3399 Belgian Francs, 6.55957 French Francs, 1.95583 German Marks, 1936.27 Italian Lire, 2.20371 Netherlands Guilders, 200.482 Portuguese Escudos, 166.386 Spanish Pesetas, 340.750 Greek Drachmas.

Lastly, the OECD provided the long term interest rates required for the forward rates methodology (OECD, 2015). OECD data were available from the online database StatExtracts and provided the long term interest rates as a percent per annum from the monthly monetary and financial statistics. An example of the data is shown in Table 8.

Table 8 OECD Long Term Interest Rates, Percent Per Annum Example

Subject		Long-term interest rates, Per cent per annum				
Frequency		Monthly				
Time		Sep-2004	Oct-2004	Nov-2004	Dec-2004	Jan-2005
Country						
Denmark	i	4.3755	4.229	4.0932	3.8462	3.7348
Japan	i	1.393	1.483	1.452	1.397	1.31
Korea	i	4.14	4.05	3.96	3.85	4.42
Norway	i	4.23	4.19	4.05	3.94	3.9
United Kingdom	i	4.9109	4.7683	4.6903	4.5316	4.5419
United States	i	4.13	4.1	4.19	4.23	4.22
Euro area (18 countries)	i	4.114	3.9794	3.8687	3.6893	3.6336

Methods

This research compared six techniques for determining the budgeted foreign exchange rate. They are the forecasts from Global Insight, the status quo, forward rates, ARIMA, the Random Walk model, and futures contract settlement prices. Each technique provides a different approach to forecasting an exchange rate or highlighted in the literature (the Random Walk model is a special type of ARIMA).

Global Insight

Global Insight provides a web-based application from which to view the company's forecasted foreign exchange rates. Included in this application are archived tables from past forecasts. Global Insight publishes forecasts quarterly with quarterly forecasts two years from the published date and annual forecasts nine years from the published date. This thesis applied the annual forecasts as a simulated budgeted rate and compares that rate with the actual monthly rates of the year in question. For example, the FY06 Japanese Yen forecast derived from Table 5 used the 2005 annual exchange rate forecast as the Global Insight 1 year forecast, the 2006 annual exchange rate forecast as

the Global Insight 2 year forecast, and the mean of the two as the Global Insight 1-2 year average forecast. This is done for each year and currency in the forecast period.

Status Quo

The current method to determine the budgeted rate consists of a center-weighted-average technique. This technique pulls the average monthly exchange rate for the past five years and the exchange rate 12 months prior from the Federal Reserve's H.10 foreign exchange report. Each of these is weighted equally and combined to form a budgeted exchange rate. The next step is to calculate the forecast error for the five year average and the rate 12 months prior. The forecast error is the sum of squared errors (SSE) between the forecasted rate and the actual rate from previous forecasts. The formula is

$$SSE = \sum (R_{Forecasted} - R_{Observed})^2$$

where $R_{Forecasted}$ is the forecasted exchange rate and $R_{Observed}$ is the actual exchange rate. The summation is over from the most recent observed exchange rate to 60 months previous (e.g. from September 2005 to August 2010). To minimize the forecast error, the weights of the five year and 12 months prior are determined by Excel's add-in Solver. Solver optimizes the weight to minimize the forecast error, the dependent variable, by iteratively changing the weights, as the independent variables. Finally, the results are reviewed for any long term trends or changes to the currency. Adjustments are made to account for fundamental changes (e.g. changing the peg of the Kuwaiti Dinar from the US dollar to a basket of currencies in May 2007 caused the five year average to be a three average in 2010).

Forward Rate

Groshek and Felli found the use of forward contracts can reduce expected costs on the order of 3.5% rather than using a naïve approach (Groshek and Felli, 2000). Their approach is used in this research to compare with the other methods in validating whether forward rate contracts should be used in mitigating currency exchange risks. The forward rate approach begins by determining the total US dollar equivalent of the DoD's foreign commitments by applying forward rates to the estimated foreign currency requirement. The technique assumes the amount budgeted for foreign currency equals the amount liquidated. Next, the technique calculates the difference in values between using the former naïve based approach and the forward rates based approach (represented as V_N^F) with the following equation:

$$V_N^F = \sum_{j=1}^{C} \sum_{k=1}^{T} S_k^j \left\{ r_B^j \left(1 + \frac{k(1-\delta)(i_B^0 - i_B^j)}{T} \right) - r_{L_k}^j \right\}$$

C is the number of foreign currencies in the analysis assigned to an index from 1,2,…,C, and *T* designates the number of periods in the budget cycle. S_k^j is the sum of money in currency *j* (the US is j=0) the DoD must liquidate at the end of period *k*. The budgeted spot rate for country *j* is r_B^jwhile the liquidation spot rate at the end of period *k* is $r_{L_k}^j$. The variable δ represents the annual discount rate. The difference in the annual interest rate between the US (j=0) and country *j* is $(i_B^0 - i_B^j)$. Interest rates came from *The Economist* in weekly observations. The authors then completed 25,000 Monte Carlo simulations to judge the effectiveness of the model.

This research uses a less complex version for calculating forward rates due to not having the amount of funding required for each year in our study. The following equation was employed to calculate the forward exchange rate used for the budgeted rate:

$$r_j = r_K^{j=0} \frac{1 + i_j}{1 + i_{j=0}}$$

The equation gives the forward exchange rate, r_j, for country j using the US dollar spot rate, $r_K^{j=0}$, in annual terms of year k and the interest rate, i_j, of country j in the month of December before the fiscal year of interest (Feenstra and Taylor, 2008). As an example, for FY06 the Euro forward rate is 0.720868049 as calculated with an $r_K^{j=0}$ of 0.803988 Euro to US dollars annual exchange rate from the FRB H.10 report, an i_j of 3.6893 and a $i_{j=0}$ of 4.23 as the long-term interest rates per annum in December from the OECD monthly monetary and financial statistics dataset.

ARIMA

The ARIMA method integrates an auto regressive, moving average, and differencing parameters to predict future points in a time series. Figure 3 represents the Box and Jenkins process for applying a univariate, time series ARIMA model. It encompasses three phases: identification, estimating and testing, and application.

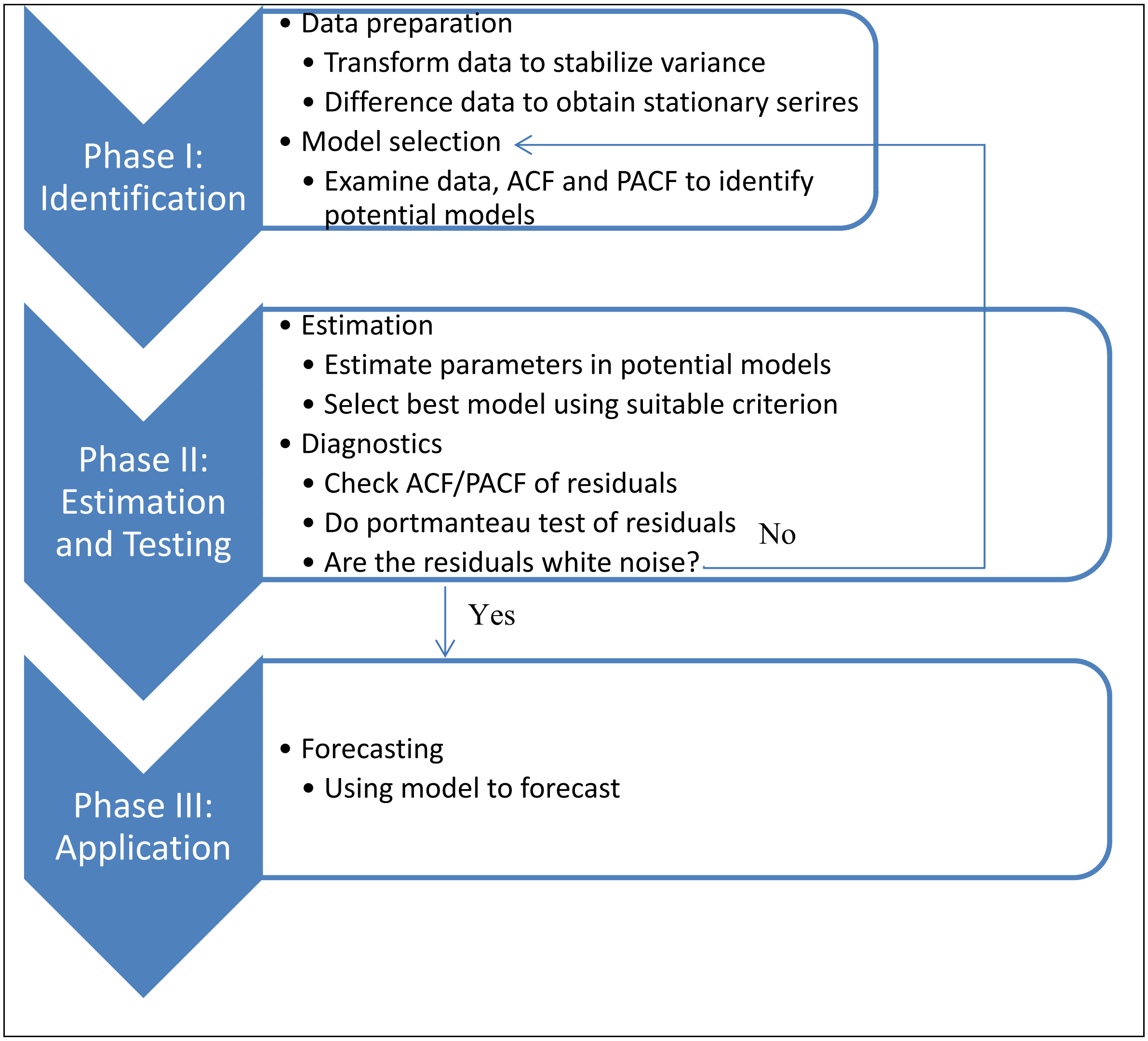


Figure 3 Box-Jenkins process for time series modeling (Makridakis et al, 1998)

Identification consists of data preparation and model selection. Under data preparation, the data are arranged in a time series plot and stabilized, meaning the data must be roughly horizontal along the time axis (x-axis). Plotting the data allows assessment on the stationarity of the data. Stationarity is the lack of change in the mean or variance of the data over time. Stationarity is assessed with the Dickey-Fuller test (Makridakis et al., 1998). The test estimates the following regression model

$$Y_t' = \varphi Y_{t-1} + b_1 Y_{t-1}' + b_2 Y_{t-2}' + \cdots + b_p Y_{t-p}'$$

with Y' as the differenced series Y_t - Y_{t-1}. If Y_t is stationary, then the estimated value of φ will be negative. A φ value close to zero means Y_t needs differencing. Ordinary least squares are used to estimate φ from the regression model. The autocorrelation function (ACF) and partial autocorrelation function (PACF) also test stationarity. The ACF gauges how successive Y values relate to each other and is calculated by:

$$r_k = \frac{\sum_{t=k+1}^{n}(Y_t - \bar{Y})(Y_{t-k} - \bar{Y})}{\sum_{t=1}^{n}(Y_t - \bar{Y})^2}$$

PACF removes the effects of other time lags in the time series to measure the degree of association between Y_t and Y_{t-k}. PACF's formula is:

$$Y_t = b_0 + b_1 Y_{t-1} + b_2 Y_{t-2} + \cdots + b_k Y_{t-k}$$

To show stationarity, the ACF and PACF quickly converge on zero. Should the data appear non-stationary, differencing the data may induce stationary in the mean. Below is the equation for differencing:

$$Y_t' = Y_t - Y_{t-k}$$

Stationarity in the variance can be achieved by transforming the data through a logarithmic or power function. After achieving stationarity, the ACF and PACF are examined for patterns. The patterns may indicate choosing a model for seasonality, auto regression, moving averages, or a mixture. Parameters for the selected are then estimated for the chosen model using the method of least squares. The ARIMA general equation is

$$(1 - \varphi_1 B)(1 - B)Y_t = c + (1 - \theta_1 B)e_t$$

This is an ARIMA(1,1,1) model with φ_1 as the auto regressive parameter, θ_1 as the moving average parameter, and (1-B) as the differencing parameter. B represents the lag

operator to incorporate the previous time series element ($BY_t = Y_{t-1}$ for all $t>1$). The e_t variable is an error term and is assumed to be independent and identically distributed along a normal distribution with a mean of zero. The constant, c, is an overall level for the dependent variable and represents stationarity (the data's mean and/or variance are approximately horizontal along the time axis). The parameter estimates are then tested for significance using the coefficient's standard error. Standard error analysis provides a P-value from which we can calculate statistical significance (a two-sided test was used with an $\alpha = 0.05$). Given the parameter estimates are statistically significant, a diagnostic analysis is done on the ACF/PACF and portmanteau residuals to check for "white noise." The ACF and PACF residuals are plotted and scaled so that variance equals one. Any residuals less than -3 or greater than 3 are outliers. A portmanteau test is an additional analysis of residuals. The portmanteau test uses the Box-Pierce test Q statistic:

$$Q = n \sum_{k=1}^{h} r_k^2$$

where h is the maximum lag being considered and n is the number of observations in the series (Makridakis et al, 1998). If the ARIMA model's residuals are "white noise", then the Q statistic has a chi-squared distribution with (h-m) degrees of freedom (m is the number of parameters in the model). A significant test result from the residual diagnostic indicates an inadequate model, and the process revisits the identification step to discern a better ARIMA model. A model that successfully passes the residual diagnostic is ready for forecasting application.

When choosing between ARIMA models, the Akaike Information Criterion (AIC) provides a measure in choosing the most adequate model (Burnham and Anderson, 2004). The AIC is an estimate of the information loss in a model and is calculated by:

$$AIC = -2LogLikelihood + 2k$$

The term *k* is the number of estimated parameters, including intercept and error terms in the model. A lower AIC value guards against information loss and the better the model at estimating (SAS Institute Inc, 2014).

For this research, Y_t is the forecasted exchange rate of interest and *t* is the time period of interest. Y_t is calculated for a budget forecast rate and compared to the actual rate to calculate the APE. Time-lagged foreign exchange rates make up the explanatory variables for estimating the ARIMA parameters. Annual forecasts were done using the JMP ARIMA model grouping. The model group allow for testing 27 separate ARIMA models for each currency by fiscal year (from ARIMA(0,0,0) to ARIMA (2,2,2) or 3^3 possibilities). The model with the lowest AIC provided the estimate for the budgeted rate. The immediate estimate from the model gave the 1 year estimate while the Y_{t+1} provided the 2 year estimate. These two estimates were then averaged to arrive at a 1-2 year average estimate as another budgeted rate to test against.

Random Walk

The Random Walk method is a special type of ARIMA model. ARIMA(0,1,0) represents the Random Walk and lacks an autoregressive and moving average parameters but maintains a difference (Nau, 2014). Random Walks can have extended periods of

apparent trends which unpredictably change direction. The mathematical representation is:

$$Y_t = Y_{t-1} + \varepsilon_t$$

where the forecasted value, Y_t, equals the previous value, Y_{t-1}, plus an error term, ε_t. In order to generate a budgeted rate, the thesis uses historical exchange rates to derive an error term. This error term is added to the last data point for the exchange rate to create a budgeted exchange rate. The immediate estimate from the model gave the 1 year estimate while the Y_{t+1} provided the 2 year estimate. These two estimates were then averaged to arrive at a 1-2 year average estimate as another budgeted rate to test against.

Futures

The futures method uses the settle rate from Table 6 as the key input in producing a budgeted rate. The intuition of using futures data is the price of the futures contract aggregates the information of the buyers and sellers of the contract in divining the true value of the underlying currency. The data contains daily settle prices, which we averaged annually from January 1st to December 31st and for the month of October as the budgeted rate for the following fiscal year. For example, the settle prices from 1 January 2004 to 31 December 2004 were averaged for the Futures Annual Mean 1 Year forecast of FY06. The average settle price for the month of October 2004 was used as the Futures October Mean for FY06.

Comparison

The comparison uses the median of the Absolute Percent Error (APE):

$$APE = \left|\frac{X_{actual} - X_{forecasted}}{X_{actual}}\right|$$

To compute the median, the APEs are arranged from lowest to largest APE from APE_1, APE_2, …, APE_n before choosing the APE at $\frac{n}{2}$ as the median. If $\frac{n}{2}$ does not provide a whole number (e.g.if n=9, $\frac{9}{2} = 4.5$), then the average between the two nearest APEs serves as the median (e.g. $\frac{APE_4+APE_5}{2}$). After calculating the median APE of all six methods, the thesis compares the accuracy of forecasting exchange rates. The lowest median indicates the more accurate method of forecasting as the forecast is relatively closer to the actual rate. Other considerations include the frequency of over estimating against under estimating the actual rate. Ideally, the forecast would match the actual rate although, given the uncertainty of requesting additional funds from Congress during the execution phase, over estimating the required amount of currency is preferred to under estimating

After calculating the APE for each currency by method, the thesis performed a bootstrap analysis on the median to examine whether the methods are from the same population in a statistically significant manner. The bootstrap method resample's each method's APEs with replacement to create a large number of sample statistics (Singh and Xie, 2008). In this case, the median is resample 10,000 times, and find a 95% percentile confidence interval (using α=2.5% two-tailed interval). The bootstrap sample medians with confidence intervals are then compared to the other methods by overlapping confidence intervals. Should one method's confidence interval overlap another method, the two methods may come from the same population, and are therefore not significantly different. The JMP® program draws on the entire APE distribution as the bootstrap

sample for every bootstrap iteration (i.e. an APE sample of 752 means each bootstrap sample will also have 752 samples but with replacement for each sample taken from the original APE sample) (Ramsey, 2013). Fractional weighting was not used from the original sample APE's distribution for the bootstrap.

Finally, the thesis compares methods by how often the budgeted rate is greater than the actual rate. Each month will show which rate is higher. Assuming a risk adverse DoD, a higher actual rate is preferred. For example, a ¥1,000 requirement in US dollars at 110 Yen per dollar budgeted rate equals a budget of $9.09. If the actual rate were 100 yen per dollar at the time of execution, the amount needed to cover the requirement is $10. For each method and each time period, the chance of budgeting too little is calculated by dividing the number of months the budgeted rate is greater than the actual rate by the total number of months in that period. A lower percent decreases chance of budgeting too little.

Long Term Study

Given the small time frame, a broader understanding of the problem required greater data points to reach a firm decision. From FY06 to FY14 only offered nine opportunities to calculate a budgeted rate. Extending the study period to FY91 offered 16 additional years and to FY79 offered 28 additional opportunities at formulating and testing budgeted rates through the various methods. These additional study periods, however, could not use all of the currencies and methods as the FY06 to FY14 study period.

Study Period from FY91 to FY12

The study period from FY91 to FY12 encompasses a total of 22 years, or 22 attempts at forecasting a budgeted rate. While data for some countries extend to this date and beyond, only the Japanese Yen and United Kingdom Pound were examined. These two currencies could be used for each method compared in this time period. Methods for this time period compose of ARIMA, Random Walk, futures, forward rates, and the status quo. The Global Insight database did not extend as far back as FY91. Each methodology forecasted a budgeted rate for FY91 which was then compared to the FRB H.10 monthly averages to derive an APE for that month. The monthly APEs were then averaged for the fiscal year. The mean and median were both recorded in order to compare the different methods. To identify whether methods were statistically different, a bootstrap with 10,000 samplings for each method's median provided a distribution of the median to compare against other methods. Any median distribution overlapping the median distribution of a different method could be considered statistically the same.

Study Period from FY79 to FY12

The study period from FY79 to FY12 encompasses a total of 34 attempts at forecasting a budgeted rate. During this period, the Japanese Yen and United Kingdom Pound are again the currencies examined. The methods compose of ARIMA, Random Walk, futures, and the status quo. The long term interest rates data did not contain the rate for Japan before 1989 precluding the use of the forward rates methodology earlier than FY91. Each methodology forecasted a budgeted rate for FY91 which was then compared to the FRB H.10 monthly averages to derive an APE for that month. The monthly APEs were then averaged for the fiscal year. The mean and median were both

recorded in order to compare the different methods. To identify whether methods were statistically different, a bootstrap with 10,000 samplings for each method's median provided a distribution of the median to compare against other methods. Any median distribution overlapping the median distribution of a different method could be considered statistically the same.

Summary

Using five sets of data sources, the thesis compares six methodologies in order to recommend the one with the lowest median APE. The forecasts from Global Insight are the first of six forecast methodologies tested. The other five include the status quo forward rate, ARIMA, the Random Walk, and futures settlement prices. The thesis contrasts these forecasts against the actual rate to find the monthly APE. The median APE allows comparison of the six techniques in terms of accuracy. Objectivity and complexity of the techniques provide additional criteria to compare the six techniques. After reviewing the APE, simplicity, and risk in budgeting too little, the thesis will recommend a technique for use by the DoD.

IV. Results

Chapter 4 states the results of applying each methodology. The chapter provides each method's MAPE compared to the status quo, before providing a comparison of all methodologies. A summary of the chapter briefly reviews the material covered in this chapter.

Global Insight

Table 9 compares the Global Insight 1 year, 2 year, and 1-2 year average forecast rate mean APE (MAPE) against the status quo MAPE from Fiscal Year 2006 to FY 2014 (FY06 to FY14).

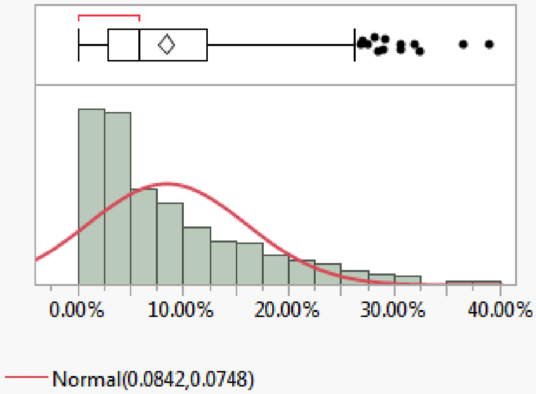
Table 9 Global Insight 1 Year, 2 Year, 1-2 Year Average and Status Quo MAPE for FY06 - FY14 and Probability of Budgeted Rate Greater than the Adjusted Rate

FY	Status Quo MAPE	Status Quo Percent Budget Rate > Adjusted Rate	Global Insight 1 Year MAPE	Global Insight 1 Year Percent Budget Rate > Adjusted Rate	Global Insight 2 Year MAPE	Global Insight 2 Year Percent Budget Rate > Adjusted Rate	Global Insight 1-2 Year Average MAPE	Global Insight 1-2 Year Average Percent Budget Rate > Adjusted Rate
6	10.18%	83.33%	9.07%	60.42%	9.22%	62.50%	9.14%	62.50%
7	14.05%	75.00%	8.63%	52.08%	12.38%	56.25%	9.41%	70.83%
8	11.85%	87.50%	5.48%	50.00%	4.41%	41.67%	4.32%	43.75%
9	16.69%	50.00%	18.45%	50.00%	15.99%	43.75%	17.20%	50.00%
10	9.98%	62.50%	7.02%	64.58%	7.55%	45.83%	7.02%	54.17%
11	10.53%	60.42%	5.57%	56.25%	8.42%	43.75%	6.54%	45.83%
12	7.06%	31.25%	3.65%	41.67%	5.96%	39.58%	4.72%	45.83%
13	6.51%	12.50%	7.69%	27.08%	8.05%	22.92%	6.74%	31.25%
14	6.56%	72.92%	10.22%	27.08%	10.14%	10.42%	9.86%	16.67%
Average	10.38%	59.49%	8.42%	47.69%	9.12%	40.74%	8.33%	46.76%

For example, the 2004 4th Quarter Cost International Forecast Table provided the Global Insight 1 and 2 year forecast for FY06 (2005 and 2006 forecasted exchange rates). Furthermore, the table includes the percentage of forecasted exchange rates exceeding the actual exchange rates. This percentage is the probability of budgeting enough funding for requirements given the applied forecasted rate as the budgeted rate as shown in Figure 1. Lastly, the countries for this data include the EU, Japan, South Korea, and the UK.

Averaging the 1 year and 2 year forecasted rates provides the best MAPE of the Global Insight data while the status quo has the highest percentage of a higher budgeted rate than adjusted rate. The distribution of Global Insight APEs gave reason to doubt the mean as a true gauge of the resulting data's central tendency. Figure 4 provides the distribution of APEs along with a box plot and normal curves. The median (50.0% quantile) is less than the mean for each of the Global Insight forecasted budgeted rates. Since normality is not present, nonparametric measures are the appropriate approach to comparing methods. The medians provide a closer approximation of the central tendency of the results, while the use of a mean would consistently skew the data to the right of the results central mass. Also, since the results are not normally distributed, the use of standard deviations does not lend itself to an adequate measure of dispersion. The inter-quartile range (IQR) is the preferred method in this research in determining the dispersion of the results.

Global Insight 1 Year APE



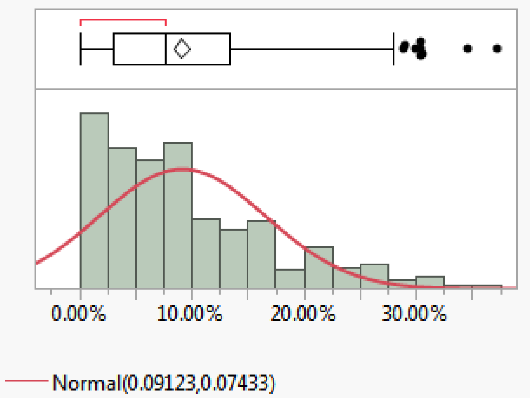
Quantiles

100.0%	maximum	0.3907
99.5%		0.35863
97.5%		0.27636
90.0%		0.1926
75.0%	quartile	0.12255
50.0%	median	0.0577
25.0%	quartile	0.0291
10.0%		0.01083
2.5%		0.0026
0.5%		0.00063
0.0%	minimum	0.0002

Summary Statistics

Mean	0.0842014
Std Dev	0.0748008
Std Err Mean	0.0035989
Upper 95% Mean	0.0912749
Lower 95% Mean	0.0771279
N	432

Global Insight 2 Year APE



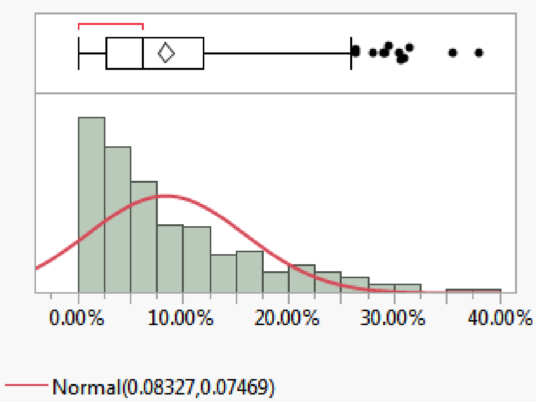
Quantiles

100.0%	maximum	0.3728
99.5%		0.34002
97.5%		0.27543
90.0%		0.20774
75.0%	quartile	0.13395
50.0%	median	0.07665
25.0%	quartile	0.03055
10.0%		0.01086
2.5%		0.00198
0.5%		0.00022
0.0%	minimum	0

Summary Statistics

Mean	0.091235
Std Dev	0.0743264
Std Err Mean	0.003576
Upper 95% Mean	0.0982636
Lower 95% Mean	0.0842063
N	432

Global Insight 1-2 Year Average APE



Quantiles

100.0%	maximum	0.3817
99.5%		0.34915
97.5%		0.26741
90.0%		0.201
75.0%	quartile	0.11948
50.0%	median	0.0607
25.0%	quartile	0.02623
10.0%		0.00989
2.5%		0.00203
0.5%		0.00092
0.0%	minimum	0.0008

Summary Statistics

Mean	0.0832748
Std Dev	0.0746903
Std Err Mean	0.0035935
Upper 95% Mean	0.0903378
Lower 95% Mean	0.0762117
N	432

Figure 4 Printout of the Global Insight APE Distribution

Forward Rate

Table 10 compares the forward rate 1 year forecast rate MAPE against the status quo MAPE from FY06 to FY14. For example, the ratio of December 2004 long-term annual interest rates multiplied by the Annual FRB H.10 rate calculates the FY06 forecasted rate. Furthermore, the table includes the percentage of forecasted exchange rates exceeding the actual exchange rates. This percentage gives the probability of budgeting enough funding for requirements given the applied forecasted rate as the budgeted rate. Lastly, the countries for this data include Denmark, the EU, Japan, Norway, South Korea, and the UK.

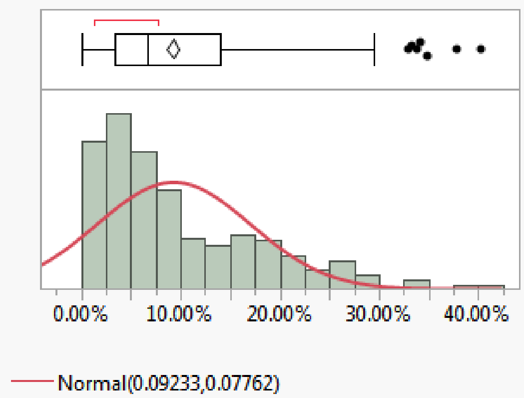
Table 10 Forward Rate and Status Quo MAPE for FY06 - FY14 and Probability of Budgeted Rate Greater than the Adjusted Rate

FY	Status Quo MAPE	Status Quo Percent Budget Rate > Adjusted Rate	Forward Rate 1 Year MAPE	Forward Rate 1 Year Percent Budget Rate > Adjusted Rate
6	8.10%	80.28%	6.11%	54.93%
7	14.19%	83.33%	7.62%	81.94%
8	16.27%	91.67%	14.45%	87.50%
9	13.43%	56.94%	16.85%	34.72%
10	9.06%	68.06%	10.96%	23.61%
11	9.15%	66.67%	8.95%	81.94%
12	6.09%	41.67%	4.54%	76.39%
13	5.61%	19.44%	5.35%	13.89%
14	5.58%	54.79%	8.26%	63.01%
Average	9.72%	62.54%	9.23%	57.55%

The forward rate calculation has a lower MAPE and percentage of a higher budgeted rate than adjusted rate compared to using the status quo. Similar to the Global Insight results, the APEs for the forward rate calculation also do not show a normal

distribution. Figure 5 provides a graph of the APE distribution. Again the median is lower than the mean and provides a better gauge of the central tendency of the results.

Forward Rate 1 Year APE



Quantiles

100.0%	maximum	0.4033
99.5%		0.34758
97.5%		0.2748
90.0%		0.21242
75.0%	quartile	0.13923
50.0%	median	0.06645
25.0%	quartile	0.03423
10.0%		0.01435
2.5%		0.00307
0.5%		0.0007
0.0%	minimum	0.0007

Summary Statistics

Mean	0.0923298
Std Dev	0.0776222
Std Err Mean	0.0030493
Upper 95% Mean	0.0983175
Lower 95% Mean	0.0863421
N	648

Figure 5 Printout of the Forward Rate APE Distribution

ARIMA

Table 11 compares the ARIMA 1 year, 2 year, and 1-2 year average forecasted rate MAPE against the status quo MAPE from FY06 to FY14. For each year and each currency, 27 different ARIMA models were made from ARIMA (0,0,0) to ARIMA (2,2,2) and ranked by AIC. The model with the lowest AIC was then chosen to forecast a budgeted rate for that currency for that year. The process was then repeated for each year and currency. For example, the time series of annual FRB H.10 foreign exchange rates until 2004 provides the data for an ARIMA model to forecast 1 year and 2 year rates for FY06 (2005 and 2006). Furthermore, the table includes the percentage of forecasted exchange rates exceeding the actual exchange rates. This percentage gives the probability of budgeting enough funding for requirements given the applied forecasted

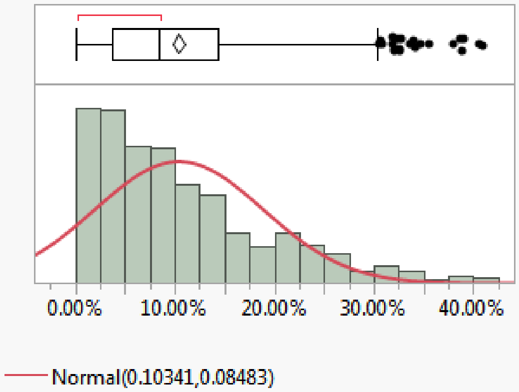
rate as the budgeted rate. Lastly, the countries for this data include Denmark, the EU, Japan, Norway, Singapore, South Korea, and the UK.

Table 11 ARIMA 1 Year, 2 Year, 1-2 Year Average and Status Quo MAPE for FY06 - FY14 and Probability of Budgeted Rate Greater than the Adjusted Rate

FY	Status Quo MAPE	Status Quo Percent Budget Rate > Adjusted Rate	ARIMA 1 Year MAPE	ARIMA 1 Year Percent Budget Rate > Adjusted Rate	ARIMA 2 Year MAPE	ARIMA 2 Year Percent Budget Rate > Adjusted Rate	ARIMA 1-2 Year Average MAPE	ARIMA 1-2 Year Average Percent Budget Rate > Adjusted Rate
6	8.03%	83.13%	6.68%	59.04%	9.76%	66.27%	8.17%	61.45%
7	13.82%	85.71%	11.85%	85.71%	16.60%	85.71%	14.22%	85.71%
8	16.19%	92.86%	17.60%	86.90%	21.51%	84.52%	19.55%	86.90%
9	12.52%	63.10%	15.08%	35.71%	16.83%	40.48%	15.70%	35.71%
10	9.15%	72.62%	7.24%	28.57%	10.46%	46.43%	7.25%	36.90%
11	10.21%	71.43%	14.68%	98.81%	18.83%	100.00%	16.75%	100.00%
12	7.13%	50.00%	4.52%	88.10%	6.41%	76.19%	5.38%	80.95%
13	5.80%	30.95%	7.52%	14.29%	7.54%	33.33%	6.71%	30.95%
14	5.17%	54.12%	8.97%	63.53%	10.81%	65.88%	9.81%	65.88%
Average	9.78%	67.10%	10.46%	62.30%	13.19%	66.53%	11.51%	64.94%

The status quo has a lower MAPE and a greater chance of a higher budgeted rate than adjusted rate compared to using ARIMA 1 year, 2 year, and 1-2 year average forecasts. As in the above methods, the APEs from the ARIMA results do not show a normal distribution. Figure 6 provides the APE distributions for each ARIMA method. The medians for each ARIMA method are also lower than the mean and provide a measure closer to the center mass of the APE distribution.

ARIMA 1 Year APE 2



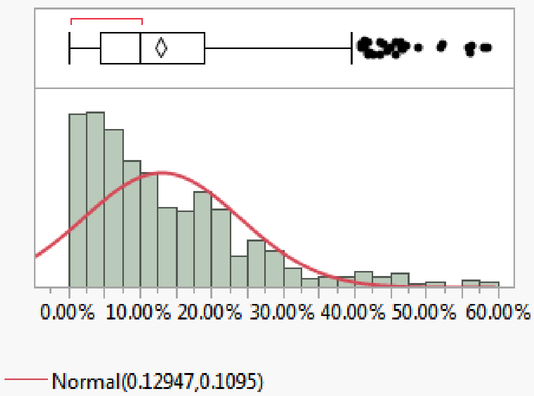
Quantiles

100.0%	maximum	0.4107
99.5%		0.3945
97.5%		0.32053
90.0%		0.23063
75.0%	quartile	0.14385
50.0%	median	0.0838
25.0%	quartile	0.03623
10.0%		0.0148
2.5%		0.00429
0.5%		0.00049
0.0%	minimum	0

Summary Statistics

Mean	0.103405
Std Dev	0.0848315
Std Err Mean	0.0030853
Upper 95% Mean	0.1094618
Lower 95% Mean	0.0973483
N	756

ARIMA 2 Year APE



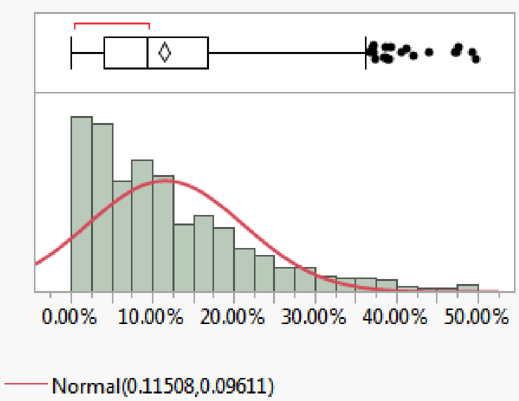
Quantiles

100.0%	maximum	0.5863
99.5%		0.56277
97.5%		0.43629
90.0%		0.27322
75.0%	quartile	0.18913
50.0%	median	0.10065
25.0%	quartile	0.04523
10.0%		0.01981
2.5%		0.00447
0.5%		0.00117
0.0%	minimum	0.0005

Summary Statistics

Mean	0.1294659
Std Dev	0.1095006
Std Err Mean	0.0039825
Upper 95% Mean	0.137284
Lower 95% Mean	0.1216478
N	756

ARIMA 1-2 Year Average APE



Quantiles

100.0%	maximum	0.4985
99.5%		0.47635
97.5%		0.37136
90.0%		0.24829
75.0%	quartile	0.16888
50.0%	median	0.0936
25.0%	quartile	0.0393
10.0%		0.01508
2.5%		0.00579
0.5%		0.00098
0.0%	minimum	0

Summary Statistics

Mean	0.1150827
Std Dev	0.0961066
Std Err Mean	0.0034954
Upper 95% Mean	0.1219445
Lower 95% Mean	0.1082209
N	756

Figure 6 JMP® Printout of the ARIMA APE Distribution

Random Walk

Table 12 compares the Random Walk model 1 year, 2 year, and 1-2 year average forecasted rate MAPE against the status quo MAPE from FY06 to FY14. For example, the time series of annual FRB H.10 foreign exchange rates until 2004 provides the data for an ARIMA(0,1,0) model to forecast 1 year and 2 year rates for FY06 (2005 and 2006). Furthermore, the table includes the percentage of forecasted exchange rates exceeding the actual exchange rates. This percentage gives the probability of budgeting enough funding for requirements given the applied forecasted rate as the budgeted rate. Lastly, the countries for this data include Denmark, the EU, Japan, Norway, Singapore, South Korea, and the UK.

Table 12 Random Walk 1 Year, 2 Year, 1-2 Year Average and Status Quo MAPE for FY06 - FY14 and Probability of Budgeted Rate Greater than the Adjusted Rate

FY	Status Quo MAPE	Status Quo Percent Budget Rate > Adjusted Rate	Random Walk 1 Year MAPE	Random Walk 1 Year Percent Budget Rate > Adjusted Rate	Random Walk 2 Year MAPE	Random Walk 2 Year Percent Budget Rate > Adjusted Rate	Random Walk 1-2 Year Average MAPE	Random Walk 1-2 Year Average Percent Budget Rate > Adjusted Rate
6	8.03%	83.13%	7.33%	49.40%	8.88%	48.19%	8.10%	49.40%
7	13.82%	85.71%	8.68%	83.33%	9.20%	82.14%	8.92%	83.33%
8	16.19%	92.86%	12.32%	85.71%	11.67%	77.38%	11.81%	82.14%
9	12.52%	63.10%	13.08%	34.52%	12.41%	28.57%	12.71%	30.95%
10	9.15%	72.62%	8.21%	23.81%	8.07%	14.29%	8.02%	21.43%
11	10.21%	71.43%	8.74%	82.14%	8.34%	69.05%	8.35%	77.38%
12	7.13%	50.00%	4.03%	73.81%	4.96%	58.33%	3.98%	63.10%
13	5.80%	30.95%	6.84%	19.05%	8.84%	19.05%	7.81%	17.86%
14	5.17%	54.12%	8.66%	54.12%	10.00%	52.94%	9.32%	54.12%
Average	9.78%	67.10%	8.65%	56.21%	9.12%	49.99%	8.78%	53.30%

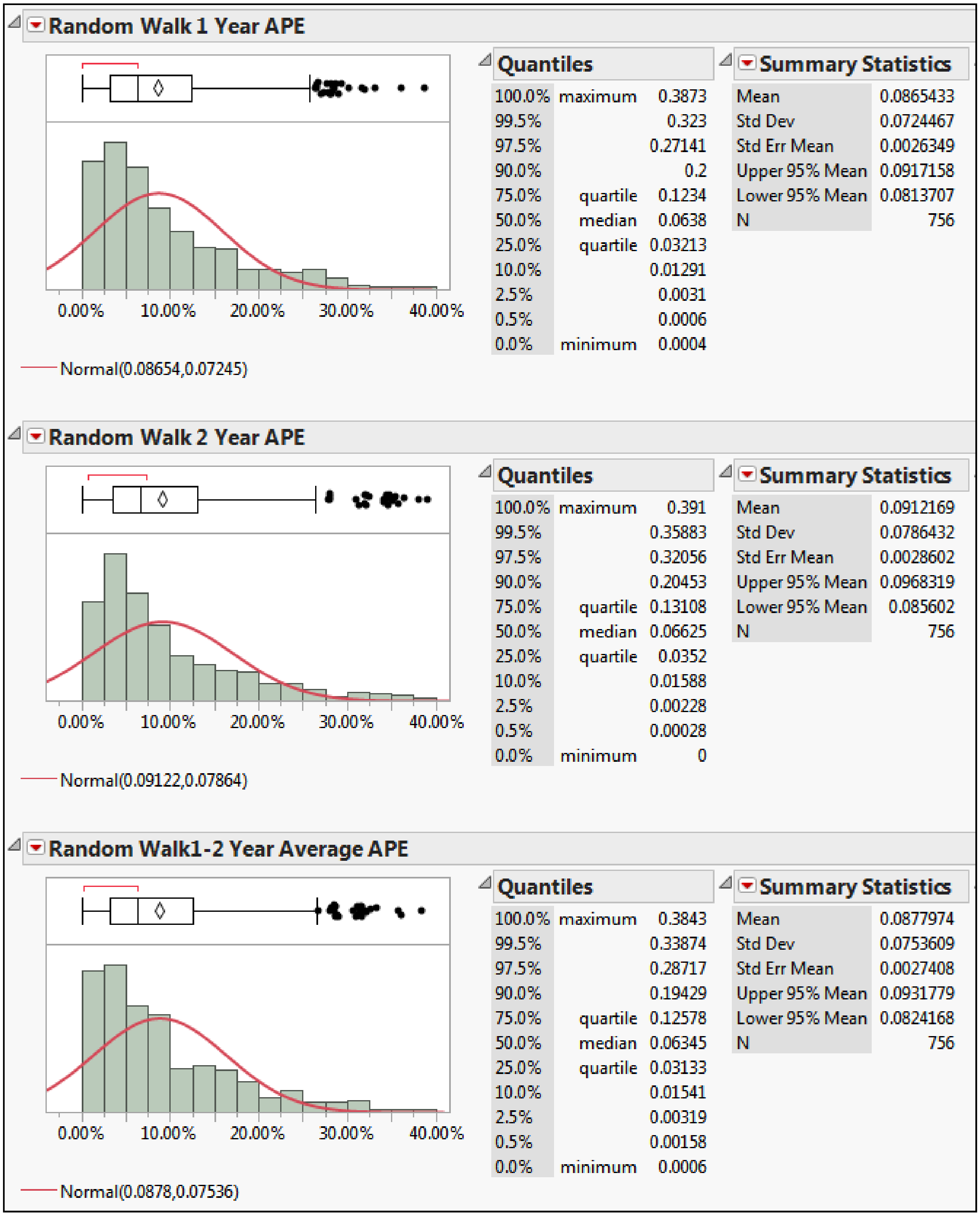


Figure 7 JMP® Printout of the Random Walk APE Distribution

The 1 year forecasted rate provides the best MAPE of the Random Walk model while the status quo has the highest percentage of a higher budgeted rate than adjusted

rate. The Random Walk model has an APE distribution skewed right similar with the above results. The mean is higher than the median, as shown in Figure 7, with the median as a better representation of the central tendency.

Futures

Table 13 compares future markets annual average and October average forecasted rate MAPE against the status quo MAPE from FY06 to FY14. For example, the futures data uses the average price of the following month's futures contract from 2004 as the forecast rate for FY06 (2005 and 2006). Furthermore, the table includes the percentage of forecasted exchange rates exceeding the actual exchange rates. This percentage gives the probability of budgeting enough funding for requirements given the applied forecasted rate as the budgeted rate. Lastly, the countries for this data include Denmark, the EU, Japan, and the UK.

Table 13 Futures Annual and October Average and Status Quo MAPE for FY06 - FY14 and Probability of Budgeted Rate Greater than the Adjusted Rate

FY	Status Quo MAPE	Status Quo Percent Budget Rate > Adjusted Rate	Futures Annual Average 1 Year MAPE	Futures Annual Average 1 Year Percent Budget Rate > Adjusted Rate	Futures October Average 1 Year MAPE	Futures October Average 1 Year Percent Budget Rate > Adjusted Rate
6	5.73%	77.78%	4.52%	30.56%	4.33%	33.33%
7	10.96%	66.67%	8.23%	66.67%	9.15%	66.67%
8	13.52%	94.44%	11.54%	94.44%	11.59%	94.44%
9	13.96%	66.67%	16.91%	50.00%	16.97%	41.67%
10	12.36%	58.33%	12.84%	38.89%	8.02%	55.56%
11	12.47%	52.78%	7.55%	77.78%	6.58%	50.00%
12	8.48%	41.67%	5.63%	77.78%	3.83%	47.22%
13	8.03%	0.00%	7.88%	11.11%	8.37%	11.11%
14	6.26%	63.89%	10.89%	63.89%	10.27%	61.11%
Average	10.20%	58.02%	9.55%	56.79%	8.79%	51.23%

The October average forecasted rate provides the best MAPE of the futures contracts model while the status quo has the highest percentage of a higher budgeted rate than adjusted rate. The APEs for this method also skew right with the mean above the median as shown in Figure 8. For comparison, using medians rather than the mean gives a better assessment of the differences between methodologies.

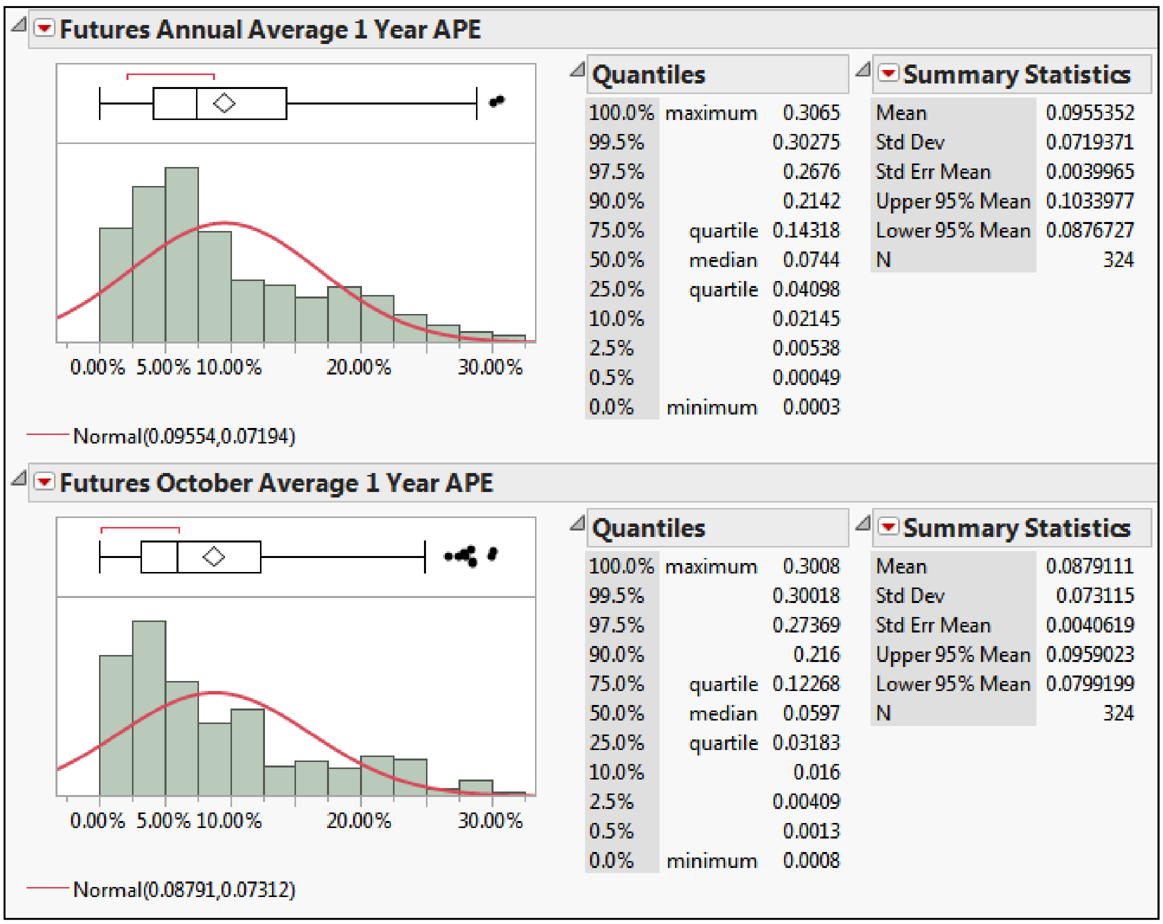


Figure 8 JMP® Printout of the Futures APE Distribution

Comparison

Table 14 presents each methodology's MAPE according to country over the time period. A highlighted MAPE is the lowest error between all available methods for that

country. Overall, Global Inisght's 1-2 year average forecast provides the lowest MAPE. Only the ARIMA 2 year and 1-2 year average had worse MAPEs than the status quo.

Table 14 Average MAPE for Each Country by Methodology from FY06 to FY14 with the Lowest MAPE Highlighted

	MAPE from FY06 to FY14												
Country	Status Quo	Global Insight 1 Year	Global Insight 2 Year	Global Insight 1-2 Year Mean	Random Walk 1 year	Random Walk 2 year	Random Walk 1-2 Mean year	Forward Rates	ARIMA 1 year	ARIMA 2 year	ARIMA 1-2 Year Mean	Futures Annual Mean 1 Year	Futures October Mean 1 Year
DENMARK	8.36%				6.70%	6.73%	6.71%	7.10%	9.70%	15.17%	11.98%		
EU	8.28%	6.57%	5.83%	5.69%	6.99%	8.10%	7.50%	6.33%	12.79%	20.73%	16.56%	6.70%	7.21%
ICELAND	19.66%												
JAPAN	13.55%	12.20%	12.28%	11.99%	13.15%	14.35%	13.08%	14.89%	14.01%	15.42%	14.71%	14.07%	12.21%
NORWAY	8.45%				8.28%	8.37%	8.32%	8.51%	9.10%	10.81%	9.79%		
SINGAPORE	10.13%				5.79%	5.51%	5.62%		6.04%	6.71%	6.28%		
SOUTH KOREA	10.93%	8.66%	11.46%	9.33%	11.42%	12.25%	11.83%	10.46%	11.43%	12.31%	11.86%		
TURKEY	14.67%												
UK	8.76%	6.25%	6.92%	6.30%	8.24%	8.55%	8.39%	8.10%	9.32%	9.49%	9.35%	7.89%	6.95%
Average	11.42%	8.42%	9.12%	8.33%	8.65%	9.12%	8.78%	9.23%	10.34%	12.95%	11.51%	9.55%	8.79%

Table 15 presents a comparison between the methods using only the currencies from the EU, Japan, and the UK. Every methodology calculated a forecast for these countries and provides a fairer comparison as opposed to Table 14. The Global Insight 1 year forecast provided the best estimates for the UK Pound while the Global Insight 1-2 year average was the best forecast for the Euro, Japanese Yen, and overall average.

Table 15 Average MAPE for the EU, Japan, and the UK by Methodology from FY06 to FY14 with the Lowest MAPE Highlighted

	MAPE from FY06 to FY14												
Country	Status Quo	Global Insight 1 Year	Global Insight 2 Year	Global Insight 1-2 Year Mean	Random Walk 1 year	Random Walk 2 year	Random Walk 1-2 Mean year	Forward Rates	ARIMA 1 year	ARIMA 2 year	ARIMA 1-2 Year Mean	Futures Annual Mean 1 Year	Futures October Mean 1 Year
EU	8.28%	6.57%	5.83%	5.69%	6.99%	8.10%	7.50%	6.33%	12.79%	20.73%	16.56%	6.70%	7.21%
JAPAN	13.55%	12.20%	12.28%	11.99%	13.15%	14.35%	13.08%	14.89%	14.01%	15.42%	14.71%	14.07%	12.21%
UK	8.76%	6.25%	6.92%	6.30%	8.24%	8.55%	8.39%	8.10%	9.32%	9.49%	9.35%	7.89%	6.95%
Average	10.20%	8.34%	8.34%	7.99%	9.46%	10.33%	9.66%	9.77%	12.04%	15.21%	13.54%	9.55%	8.79%

As mentioned above, the mean is not the best measure of central tendency for each month's results. The APE distributions are skewed to the right. Comparing medians offer a better approach to choosing the lowest APE methodology. Table 17

examines the median APE for currencies with every available methodology, and, as in Table 15, the overall best method is the average October futures contract.

Table 16 recreates Table 14 with medians rather than means. Judging by the average (mean) of each country's median, the best overall method is the Global Insight forecast 1 year forecast as opposed to the average 1-2 year forecast. Table 17 examines the median APE for currencies with every available methodology, and, as in Table 15, the overall best method is the average October futures contract.

Table 16 Median APE for Each Country by Methodology from FY06 to FY14 with the Lowest Median APE Highlighted

	Median APE from FY06 to FY14												
Country	Status Quo	Global Insight 1 Year	Global Insight 2 Year	Global Insight 1-2 Year Mean	Random Walk 1 year	Random Walk 2 year	Random Walk 1-2 Mean year	Forward Rates	ARIMA 1 year	ARIMA 2 year	ARIMA 1-2 Year Mean	Futures Annual Mean 1 Year	Futures October Mean 1 Year
DENMARK	4.67%				5.63%	5.48%	5.57%	5.50%	7.64%	15.00%	11.14%		
EU	5.32%	4.93%	5.11%	4.65%	5.94%	7.90%	6.61%	4.56%	10.42%	17.71%	11.66%	5.21%	5.28%
ICELAND	16.50%												
JAPAN	15.42%	11.74%	10.59%	11.80%	12.61%	10.28%	13.24%	15.20%	13.90%	16.45%	14.97%	13.27%	10.80%
NORWAY	6.91%				6.36%	6.85%	6.55%	6.34%	6.70%	7.79%	7.55%		
SINGAPORE	10.12%				4.85%	4.87%	4.64%		4.55%	6.03%	5.29%		
SOUTH KOREA	7.34%	5.34%	9.83%	7.04%	9.27%	10.11%	9.71%	8.08%	8.88%	8.68%	8.73%		
TURKEY	14.10%												
UK	8.97%	4.18%	5.09%	3.90%	5.87%	6.82%	6.34%	5.45%	8.96%	8.84%	8.86%	5.15%	3.93%
Average	9.93%	6.55%	7.66%	6.85%	7.22%	9.12%	7.52%	9.23%	10.34%	12.95%	9.74%	7.88%	6.67%

Table 17 Median APE for the EU, Japan, and the UK by Methodology from FY06 to FY14 with the Lowest Median APE Highlighted

	Median APE from FY06 to FY14												
Country	Status Quo	Global Insight 1 Year	Global Insight 2 Year	Global Insight 1-2 Year Mean	Random Walk 1 year	Random Walk 2 year	Random Walk 1-2 Mean year	Forward Rates	ARIMA 1 year	ARIMA 2 year	ARIMA 1-2 Year Mean	Futures Annual Mean 1 Year	Futures October Mean 1 Year
EU	5.32%	4.93%	5.11%	4.65%	5.94%	7.90%	6.61%	4.56%	10.42%	17.71%	11.66%	5.21%	5.28%
JAPAN	15.42%	11.74%	10.59%	11.80%	12.61%	10.28%	13.24%	15.20%	13.90%	16.45%	14.97%	13.27%	10.80%
UK	8.97%	4.18%	5.09%	3.90%	5.87%	6.82%	6.34%	5.45%	8.96%	8.84%	8.86%	5.15%	3.93%
Average	9.90%	6.95%	6.93%	6.78%	8.14%	8.33%	8.73%	8.40%	11.09%	14.33%	11.83%	7.88%	6.67%

Finally, a medians comparison was accomplished via a bootstrap to distinguish which which methods are statistically the same or different. Figure 9 illustrates the results of

the bootstrap analysis based on a 95% confidence interval (the upper bound is 97.5% and the lower bound is 2.5%) across all APEs for all the countries available to a method. Methods that can be considered statistically similar are connected by horizontal lines. The medians are different from Table 16 and Table 17 due to aggregating each country's APE for the entire time frame, rather than country specific. Line "A" connects the average futures contract settlement prices in October or annually, the Global Insight forecast, a Random Walk model, or forward rates can is statistically no different than any other, and each has a lower median APE interval than the status quo. The ARIMA models can be thought of as statistically the same as the status quo (line "C" or "D") with care given to including or excluding the ARIMA 1 year or ARIMA 2 year forecast methods. All methods connected by line "A" have a lower median APE than the status quo. Table 18 is the amount of percentage points the median of each method on line "A" is lower than the status quo median as taken from Table 17 examines the median APE for currencies with every available methodology, and, as in Table 15, the overall best method is the average October futures contract.

Table 16 It also shows the opportunity cost of the status quo of using the status quo over the method (using the overall median APE from each method against all of the currencies in the FY13 FCF account).

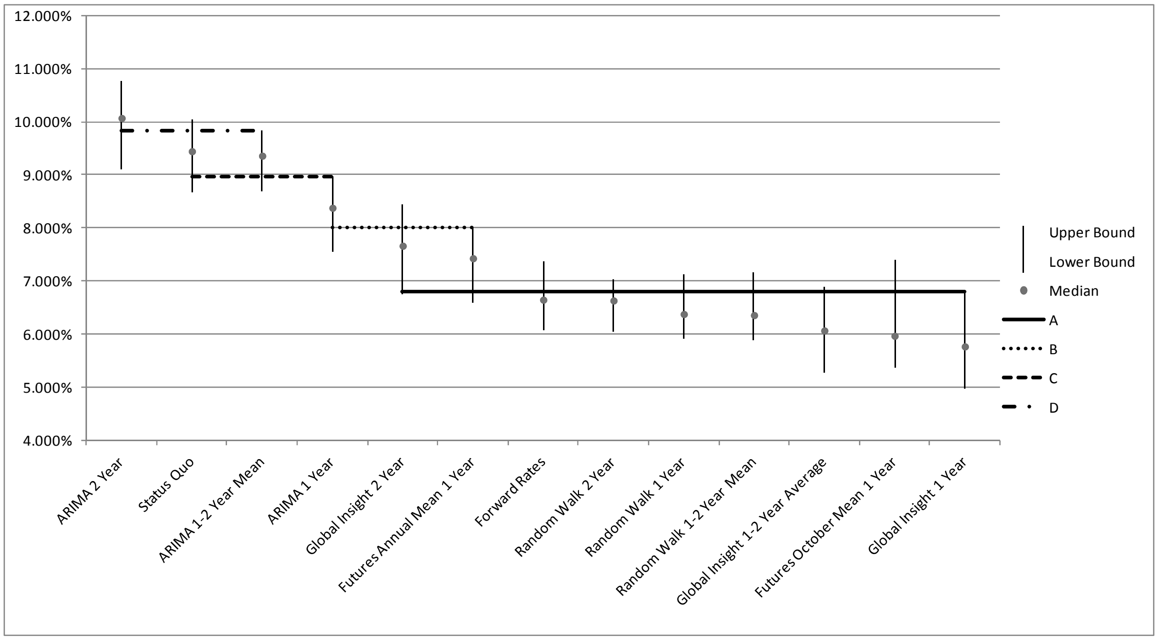


Figure 9 Medians Comparison between Methodologies Based with 95% Confidence Bounds

Table 18 The Median APE Percent of Line A Methods and the Associated Opportunity Cost of the Status Quo Over Each Method FY06-FY14

	Global Insight			Random Walk			Forward Rate	Futures	
	1 Year	2 Year	1-2 Year	1 Year	2 Year	1-2 Year		Annual	Oct
Percent Lower than Status Quo	3.38	2.27	3.08	2.71	0.81	2.41	0.70	2.05	3.26
Opportunity Cost ($M)	36.1	25.0	33.9	29.8	8.9	26.5	7.7	22.5	34.8

Long Term Comparison

The long term comparisons only include the currencies for Japan and the United Kingdom. This is due to the unavailability of data for each method for the other currencies. Furthermore, the Global Insight data is not available for the time period and that method is excluded from the analysis. Using the results from the short term study

period, median APEs are used as the primary metric in comparing methods as opposed to the MAPE.

Comparison from FY91 to FY12

The FY91 to FY12 period uses the status quo, Random Walk model, forward rates, ARIMA, and futures data as the methods of comparison. The lowest median is highlighted in yellow. Consistent with the shorter time period findings, the average futures contract settlement price in October provides the lowest median APE as shown in Table 19. A comparison of the method medians by currency in Table 20 also highlights the average futures contract in October as the lowest median APE for the Pound while the Random Walk 2 year forecast has the lowest median for the Yen.

Table 19 Median APE Combining All Countries from FY91 to FY12 with Inter-Quartile Range

	Median APE for All Countries									
	Status Quo	Random Walk 1 year	Random Walk 2 year	Random Walk 1-2 Mean year	Forward Rates	ARIMA 1 year	ARIMA 2 year	ARIMA 1-2 Year Mean	Futures Annual Mean 1 Year	Futures October Mean 1 Year
Median (IQR)	10.285 (5.728-15.643)	8.73 (4.04-14.725)	8.86 (4.213-16.43)	8.815 (3.695-15.09)	9.69 (3.91-16.458)	10.065 (6.02-16.258)	11.215 (6.718-17.163)	10.41 (6.498-16.76)	9.525 (4.243-14.908)	7.975 (3.54-12.82)

Table 20 Median APE by Country from FY91 to FY12 with Inter-Quartile Range

	Median APE for Countries with All Methods									
Country	Status Quo	Random Walk 1 year	Random Walk 2 year	Random Walk 1-2 Mean year	Forward Rates	ARIMA 1 year	ARIMA 2 year	ARIMA 1-2 Year Mean	Futures Annual Mean 1 Year	Futures October Mean 1 Year
JAPAN	12.22 (5.94-18.93)	10.31 (5.23-15.97)	9.27 (4.09-20.58)	9.92 (3.58-17.61)	13.63 (6.15-19.033)	12.00 (6.59-19.79)	13.85 (6.84-22.88)	13.19 (6.83-21.18)	12.10 (6.59-18.14)	9.45 (4.2-14.045)
UK	9.04 (5.55-13.52)	7.86 (3.52-12.56)	8.53 (4.26-12.96)	8.15 (3.73-12.94)	6.065 (2.745-13.488)	8.95 (4.92-13.29)	9.60 (6.26-13.58)	8.64 (6.44-13.23)	6.81 (3.18-12.36)	6.315 (3.123-11.325)

Next, a medians comparison was accomplished to distinguish which methods are statistically different. Figure 10 illustrates the results of the bootstrap analysis based on a

95% confidence interval. Methods that can be considered statistically similar are connected by horizontal lines. The best methods are the average futures contract in October and the Random Walk models. Horizontal lines connect the annual average futures contract and the forward rate method to every other model, therefore those methods were not considered different than the status quo. The ARIMA 2 year forecast performed the worst and could be considered by itself, or with the forward rates, status quo, annual average futures contract, and ARIMA 1 year and 1-2 year average forecasts. Table 21 is the amount of percentage points the median of each method on line "A" is lower than the status quo median as taken from Table 19. It also shows the opportunity cost of using the status quo over the lower APE methods (using the overall median APE from each method against all of the currencies in the FY13 FCF account).

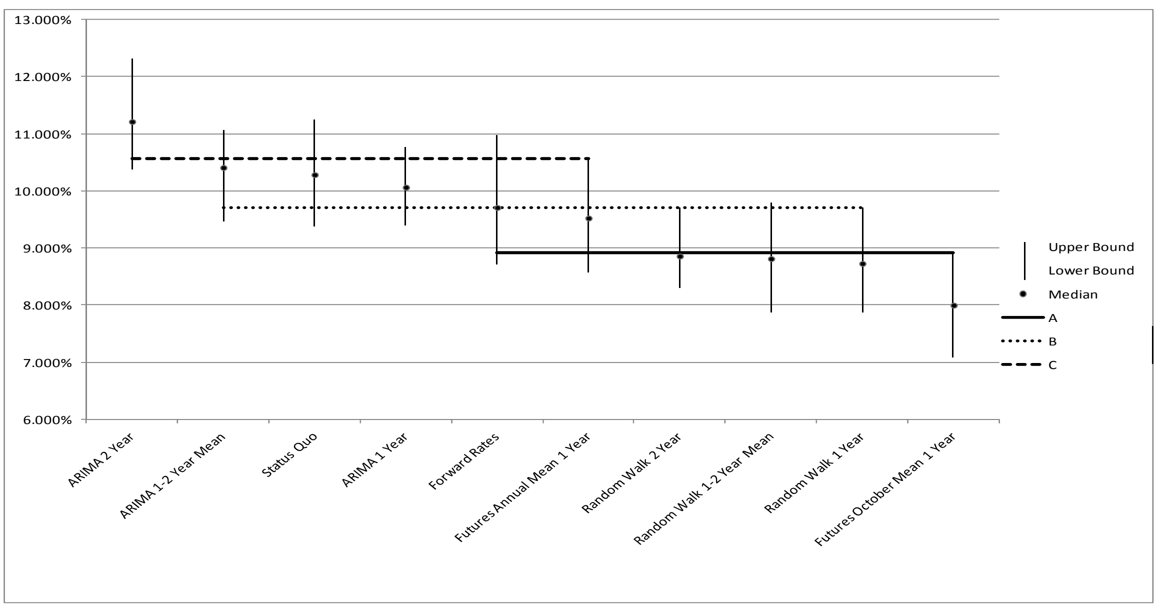


Figure 10 FY91-FY12 Medians Comparison Between Methodologies Based with 95% Confidence Bounds

Table 21 The Median APE Percent of Line A Methods and the Associated Opportunity Cost of the Status Quo Over Each Method FY91-FY12

	Random Walk			Futures
	1 Year	2 Year	1-2 Year	Oct
Percent Lower than Status Quo	1.56	1.43	1.47	2.31
Opportunity Cost ($M)	17.1	15.7	16.2	25.3

Table 22 presents the number of months the method's budgeted exchange rate is greater than the actual exchange rate. Should the actual exchange rate be lower, the US dollars allocated would not cover the requirement. For example, a ¥1,000 requirement in US dollars at 110 Yen per dollar equals a budget of $9.09. If the actual rate were 100 yen per dollar at the time of execution, the amount needed to cover the requirement is $10. The table provides the chance the method's budget would allocate enough funding to cover the actual expenses during the year of execution. Highlighted in yellow, the Random Walk 2 year forecast provides the lowest chance of the budgeted rate being higher than the actual rate.

Table 22 Comparison of Each Methods Chance of a Greater Budgeted Rate than the Actual Rate from FY91 to FY12

FY	Status Quo	Random Walk 1 Year	Random Walk 2 Year	Random Walk 1-2 Year Mean	Forward Rates	ARIMA 1 Year	ARIMA 2 Year	ARIMA 1-2 Year Mean	Futures Annual Mean 1 Year	Futures October Mean 1 Year
Percent Budget Rate > Actual Rate	57.58%	57.01%	44.70%	51.70%	63.64%	52.46%	48.30%	50.57%	62.88%	55.49%

Comparison from FY79 to FY12

The FY79 to FY12 period uses the status quo, Random Walk model, ARIMA, and futures data as the methods of comparison. Forward rates for the Bank of Japan were

unavailable before 1989 from the OECD data file. The lowest median is highlighted in yellow. The average futures contract settlement price in October provides the lowest median APE as shown in Table 23. A comparison of the method medians by currency in Table 24 also highlights the average futures contract in October as the lowest median APE.

Table 23 Median APE Combining All Countries from FY79 to FY12 with Inter-Quartile Range

	Median APE for All Countries								
	Status Quo	Random Walk 1 year	Random Walk 2 year	Random Walk 1-2 Mean year	ARIMA 1 year	ARIMA 2 year	ARIMA 1-2 Year Mean	Futures Annual Mean 1 Year	Futures October Mean 1 Year
Median (IQR)	11.3 (6.018-18.508)	11.435 (5.275-18.013)	11.435 (5.403-20.568)	11.66 (4.713-18.708)	10.945 (6.063-18.758)	13.1 (7.148-24.16)	12.095 (6.805-21.443)	11.12 (6.805-21.443)	10.085 (4.723-16.22)

Table 24 Median APE by Country from FY79 to FY12 with Inter-Quartile Range

	Median APE for Countries with All Methods								
Country	Status Quo	Random Walk 1 year	Random Walk 2 year	Random Walk 1-2 Mean year	ARIMA 1 year	ARIMA 2 year	ARIMA 1-2 Year Mean	Futures Annual Mean 1 Year	Futures October Mean 1 Year
JAPAN	11.81 (5.07-23.00)	12.17 (5.59-18.61)	12.97 (5.46-22.76)	12.17 (4.69-19.94)	12.18 (6.71-22.10)	16.12 (7.47-31.71)	14.71 (7.28-25.80)	11.89 (6.24-18.95)	10.82 (5.56-16.718)
UK	10.96 (6.53-16.05)	10.68 (4.71-17.71)	10.90 (5.32-18.06)	10.79 (4.86-17.78)	9.68 (5.07-16.84)	11.26 (6.98-17.96)	9.84 (6.45-17.29)	10.37 (4.44-17.04)	9.005 (4.153-15.343)

Next, a medians comparison was accomplished to distinguish which methods are statistically different. Figure 11 illustrates the results of the bootstrap analysis based on a 95% confidence interval. Methods that can be considered statistically similar are connected by horizontal lines. The average futures contract in October is statistically similar to the ARIMA 1 year forecast, the average annual futures contract settlement price, and the status quo. The ARIMA 2 year forecast is not connected by horizontal line to another method and can be considered statistically different. The Random Walk models, status quo, annual average futures contract, and ARIMA 1 year and 1-2 year average forecasts are not statistically different from each other. The median APE of the

futures contracts in October method is 1.2% lower than the status quo median resulting in $13.7 million opportunity cost (assuming the median of the method applied to all currencies in the FY13 FCF). At a 90% confidence interval, Figure 12, the futures contract methods and ARIMA 1 year forecast are statistically different from the status quo.

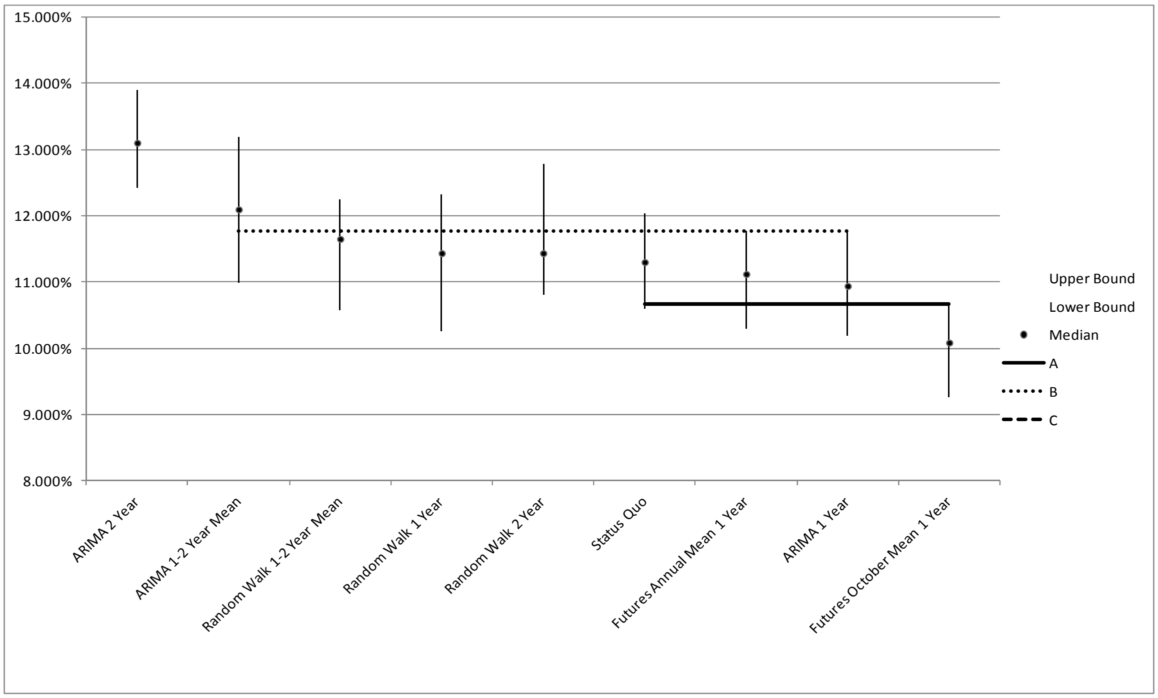


Figure 11 FY79-FY12 Medians Comparison Between Methodologies Based with 95% Confidence Bounds

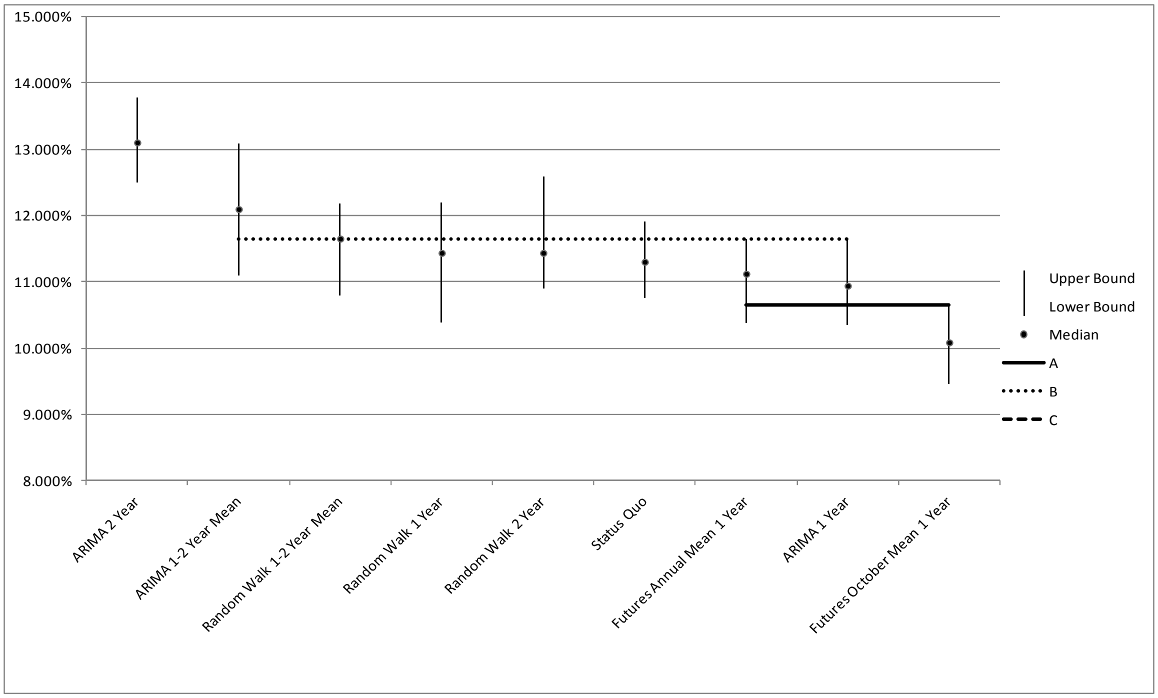


Figure 12 FY79-FY12 Medians Comparison Between Methodologies Based with 90% Confidence Bounds

Table 25 presents the number of months the method's budgeted exchange rate is greater than the actual exchange rate. Highlighted in yellow, the Random Walk 2 year forecast provides the lowest chance of the budgeted rate being higher than the actual rate.

Table 25 Comparison of Each Methods Chance of a Greater Budgeted Rate than the Actual Rate from FY79 to FY12

FY	Status Quo	Random Walk 1 Year	Random Walk 2 Year	Random Walk 1-2 Year Mean	ARIMA 1 Year	ARIMA 2 Year	ARIMA 1-2 Year Mean	Futures Annual Mean 1 Year	Futures October Mean 1 Year
Percent Budget Rate > Actual Rate	59.68%	54.53%	45.10%	50.61%	51.72%	49.14%	50.61%	60.05%	55.02%

Summary

The Global Insight's forecasts provide the lowest MAPE and median APE. The average futures contract in October provided the lowest median APE when comparing the methods with only against the Euro, Pound, and Yen. Both can be considered

statistically the same along with the Random Walk and forward rate methods using a 95% confidence interval around each method's medians. All of those models have lower median APEs than the status quo. The ARIMA models performed no better, or worse, than the status quo.

When viewed over a longer time horizon, the average futures contract in October consistently displays lower median APEs than the other methodologies while the ARIMA 2 year forecast is consistently higher. From FY91-FY12, the medians of the October futures contracts, forward rate, and Random Walk models were statistically the same but were different in the FY79-FY12 period. ARIMA 1 year forecasts and the status quo were not statistically different from the average futures contract models for the longer time period. Overall, the October futures contracts beat the status quo at each level of analysis except for the longer period. For both long term periods, the Random Walk 2 year forecast had the lowest chance of putting too little funding due to the difference in budgeted versus actual exchange rate.

V. Conclusion

This chapter reviews the research questions outlined in Chapter 1 and provides answers garnered from Chapter 4. Next, limitations in the data are explored as well as how to use the methodology in real world application. Future research naturally follows data limitations as the start of new avenues of inquiry. The chapter then summarizes the research.

Research Questions Revisited

The goal of the research is to provide a review of different forecasting methods as compared to the status quo. Specifically, this thesis examined each method in terms of variance or the deviation of the budgeted exchange rate from the actual exchange rate (as measured by the APE). After finding the mean of each method, further investigation revealed the use of the median as a more appropriate due to the skewed nature of the results. Using a bootstrap method, a 95% confidence interval was developed around each method's medians to see whether one method was statistically different from the other. Comparing these medians, the Air Force could use the Global Insight, futures contracts, forward rates, or a Random Walk model to replace the status quo method. Each method had a lower variance than the status quo and is statistically the same. Doing a longer term comparison, the Random Walk models, forward rates, and futures contracts are statistically significant and lower than the status quo from FY91 to FY12. For FY79 to FY12 the futures contracts and ARIMA 1 year forecasts are not statistically different from the status quo at 95% confidence, but are different at the 90% level. These results somewhat fit the literature. We would expect the Random Walk to perform as well as

most methods, while Groshek and Felli experienced positive results with futures contracts and forward rates. The period from FY79 to FY12 was depressing in that the futures contracts broke were no long significantly different from the status quo. This research favors using an average of the October futures contract settlement prices as the budgeted rate.

Reviewing these methods in terms of simplicity is based on the method required to attain a budgeted exchange rate as well as the ability to explain the method's logic to the GAO, Inspector General, or an auditor. Upfront, Global Insight is the simplest method as it only requires using the 4th quarter's forecast of next year's annual rate. The most complicated is the ARIMA model as it requires either a computer program or knowledgeable technician to implement. The Random Walk models used the same computer program as the ARIMA models, but the Random Walk model could be implemented with a simple formula with an estimate for the error term ($Y_t = Y_{t-1} + \varepsilon_t$). The same could be said for the forward rate, but it also requires another data source for the interest rates. The futures data is a simple average of the settle prices, but the settle prices of various contracts expiring at different dates need combined (or "rolled" together) into a continuous series. Therefore, in terms of simplicity, the Global Insight method is the simplest to formulate.

The last research question focused on the probability of budgeting too little from Figure 1. As stated, a moderately lower rate is preferred so that the DoD will not have to take additional funding from the FCF account. This would lead to an overall lowering of the current FCF and reduce the opportunity cost of maintaining such a reserve. With that said, an ideal probability would be less than 50%. Over the short term, Global Insight

was consistently under 50% across all three techniques while the Random Walk 2 year forecast was also under by 0.01%. Over the long term comparison, only the Random Walk 2 year and ARIMA 2 year forecasts managed to have a probability less than 50%. Since Global Insight has a lower median APE, and is simple to retrieve, the research supports this method in terms of the probability of having a higher budgeted rate than actual rate.

The research questions summarize to a variety of possible replacements to the status quo. In terms of variance, the futures contracts consistently provides lower medians than the status quo over the long term, but is not statistically different from the Global Insight methods in the short term. Global Insight is also the simplest method to explain, but may not have the academic literature background of the Random Walk, future contracts, and forward rate methods. Therefore it could be questionable to an auditor of the process, since the Air Force is using a rate without fully understanding how Global Insight calculates the rate (it would be a "black box" process). Finally, Global Insight consistently calculates a budgeted rate below the actual rate over the short term while the 2 year Random Walk forecast was consistent over the long term. This is preferable than a smaller budget requirement. This leads the research to recommend the average of futures contracts in October as the method to use in creating a budgeted rate. Formulating a budget rate via this method should give a 3.26% reduction to the median APE and avoid a $34.8 million opportunity cost (assuming the median APE holds for all currencies in the FY13 FCF account).

Data Limitations

Limitation in the data affected how we performed our analysis and the methods chosen. Each data set did not have all the currencies of interest over the required time periods. Global Insight data covered only the shorter period while the OECD interest rates for Japan only went back to 1989. Currency futures for other countries were available from the Chicago Mercantile Exchange (CME) Group although we did not have access to their historical data. The ideal data set would have each countries data (whether future contract prices, interest rates, or exchange rates) for the FY79 to FY14 timeframe. The OSD began publishing the adjusting rates in FY2000, and we could not use those adjusting rates to compare against each method. We therefore used the monthly average rate from the FRB H.10 report as the adjusting rates. The OSD adjusting rates and FRB H.10 monthly average do not give the exact same rate for each currency; however, they can be considered statistically the same in the median monthly rate (see Appendix F).

Future Research

The data for the futures contracts only contained three currencies and the contract were for next month, rather than for next year. The CME Group has additional currencies of interest to the DoD (such as the South Korean Won). Furthermore, CME Group data contains contracts with a variety of maturities to where an analyst could compare which contracts provide the lowest APE (e.g. using a contract with maturities at 3, 6, 9, or 12 months into the future, rather than one month). Funding, though, would be required to secure a subscription before the DoD would know if having the additional data would be economical.

Additional research into this area may focus on using more advanced forecasting techniques or the cost of changing fiscal law to allow risk mitigation techniques employed by private companies. Some research into forecasting exchange rates had success using artificial neural networks. Also, it would be interesting to see an application of the Kalman filter to exchange rate prediction. As for changing fiscal law, the ability to buy actual futures contracts does away with the need to forecast a currency rate. The DoD may have a higher exchange rate at the time of execution, but the budget would accurately reflect the requirement. The FCF could also be liquidated as the DoD would get the exact amount of currency required. Investigating the possible ramifications incurred by not allowing purchase of futures contracts would allow for a cost/benefit analysis.

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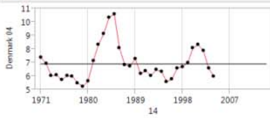
Appendix

Appendix A: ARIMA

FY06-FY14

Denmark

Time Series Denmark 04



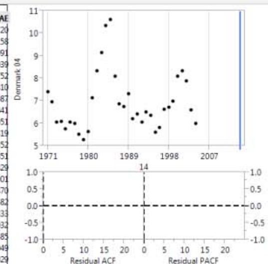
Mean	6.9220353
Std	1.2776245
N	34
Zero Mean ADF	-0.612197
Single Mean ADF	-1.813166
Trend ADF	-1.776326

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.7892	23.1009	<.0001*	1	0.7892
2	0.4423	30.5850	<.0001*	2	-0.4785
3	0.1459	31.4256	<.0001*	3	0.0255
4	-0.0789	31.6799	<.0001*	4	-0.1592
5	-0.2737	34.8414	<.0001*	5	-0.2224
6	-0.3842	41.2932	<.0001*	6	0.0175
7	-0.3964	48.4158	<.0001*	7	-0.0724
8	-0.3658	54.7146	<.0001*	8	-0.1383
9	-0.3780	61.7107	<.0001*	9	-0.2840
10	-0.3879	69.3839	<.0001*	10	-0.1045
11	-0.2987	74.1309	<.0001*	11	0.0741
12	-0.1543	75.4556	<.0001*	12	-0.1106
13	-0.0257	75.4940	<.0001*	13	-0.0528
14	0.0710	75.8021	<.0001*	14	-0.0901
15	0.1877	78.0726	<.0001*	15	0.0685
16	0.3017	84.2614	<.0001*	16	0.0399
17	0.3202	91.6441	<.0001*	17	-0.1387
18	0.2113	95.0595	<.0001*	18	-0.2068
19	0.0743	95.5104	<.0001*	19	-0.1135
20	-0.0039	95.5117	<.0001*	20	0.0370
21	-0.0590	95.8397	<.0001*	21	-0.0772
22	-0.0770	96.4442	<.0001*	22	0.0888
23	-0.0592	96.8345	<.0001*	23	-0.1028
24	-0.0396	97.0269	<.0001*	24	-0.1666
25	-0.0339	97.1828	<.0001*	25	0.0706

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	31	0.4733299	75.505537	80.084618	0.732	69.505537	0.224145	7.887191	0.548720
☐	☐	ARMA(2, 1)	30	0.4290269	75.558662	81.664104	0.748	67.558662	0.218270	7.665933	0.529158
☐	☐	MA(2)	31	0.4856175	76.831632	81.410714	0.722	70.831632	0.115497	7.946614	0.555091
☐	☐	ARMA(1, 2)	30	0.4852279	77.371776	83.477219	0.733	69.371776	0.088162	7.745340	0.539039
☐	☐	ARIMA(2, 1, 1	29	0.5066792	77.594851	83.580881	0.715	69.594851	0.078857	8.186461	0.568752
☐	☐	ARMA(1, 1)	31	0.5176562	78.321284	82.900365	0.707	72.321284	0.054840	8.019509	0.563410
☐	☐	ARMA(2, 2)	29	0.4894755	78.714465	86.346268	0.739	68.714465	0.045053	7.484618	0.520087
☐	☐	IMA(1, 1)	31	0.6029322	79.054093	82.047108	0.661	75.054093	0.038016	8.501217	0.587841
☐	☐	ARI(1, 1)	31	0.6151848	79.701737	82.694752	0.655	75.701737	0.027500	8.492477	0.588051
☐	☐	ARI(2, 1)	30	0.6070781	80.269930	84.759452	0.669	74.26993	0.020699	8.385430	0.579319
☐	☐	IMA(1, 2)	30	0.614633	80.667128	85.156651	0.666	74.667128	0.016971	8.430035	0.582352
☐	☐	ARIMA(1, 1, 2	29	0.5930401	80.736328	86.722358	0.687	72.736328	0.016394	8.119438	0.558851
☐	☐	ARIMA(1, 1, 1	30	0.6193229	80.878458	85.367981	0.663	74.878458	0.015269	8.484780	0.586429
☐	☐	ARIMA(2, 1, 2	28	0.5394234	81.819903	89.302441	0.696	71.819903	0.009536	7.731966	0.538901
☐	☐	IMA(2, 2)	29	0.6440821	82.598810	86.996018	0.634	76.59881	0.006460	8.872787	0.613470
☐	☐	I(1)	32	0.6948569	82.620851	84.117358	0.598	80.620851	0.006389	8.898599	0.629582
☐	☐	ARIMA(1, 2, 1	29	0.6578917	82.925421	87.322629	0.630	76.925421	0.005487	8.864470	0.612333
☐	☐	AR(1)	32	0.6329872	83.828044	86.880766	0.632	79.828044	0.003494	8.597860	0.616032
☐	☐	ARIMA(2, 2, 1	28	0.6514881	83.907169	89.770113	0.642	75.907169	0.003358	8.796822	0.606485
☐	☐	ARIMA(1, 2, 2	28	0.6637085	84.254282	90.117226	0.637	76.254282	0.002823	8.889746	0.612949
☐	☐	ARIMA(2, 2, 2	27	0.6912499	86.693931	94.022610	0.632	76.693931	0.000834	8.948539	0.618029
☐	☐	IMA(2, 1)	30	0.8301909	87.057275	89.988747	0.548	83.057275	0.000695	9.471690	0.658137
☐	☐	I(2)	31	0.8841111	87.854587	89.320323	0.504	85.854587	0.000467	11.559993	0.787394
☐	☐	ARI(2, 2)	29	0.8442477	88.422237	92.819445	0.556	82.422237	0.000351	10.229189	0.700141
☐	☐	ARI(1, 2)	30	0.8804074	88.706665	91.638137	0.522	84.706665	0.000305	10.798178	0.739346
☐	☐	MA(1)	32	0.7724009	90.471367	93.524088	0.551	86.471367	0.000126	10.022893	0.706087
☐	☐	ARIMA(0, 0, 0	33	1.6817887	115.14799	116.67435	0.000	113.14799	0.000000	13.754370	0.980708



Model: AR(2)

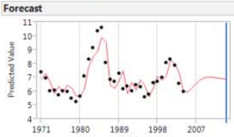
Model Summary

DF	31	Stable	Yes
Sum of Squared Errors	14.6732264	Invertible	Yes
Variance Estimate	0.47332988		
Standard Deviation	0.68798974		
Akaike's 'A' Information Criterion	75.5055369		
Schwarz's Bayesian Criterion	80.0846184		
RSquare	0.7318195		
RSquare Adj	0.71451754		
MAPE	7.88719138		
MAE	0.54872036		
-2LogLikelihood	69.5055369		

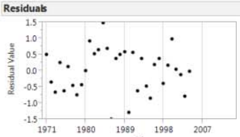
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.196777	0.1439667	8.31	<.0001*	2.12460551
AR2	2	-0.504341	0.1418775	-3.55	0.0012*	
Intercept	0	6.907860	0.3600180	19.19	<.0001*	

Forecast

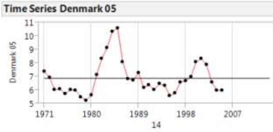


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0108	0.0043	0.9475	1	0.0108
2	-0.0625	0.1536	0.9261	2	-0.0626
3	-0.0322	0.1945	0.9785	3	-0.0309
4	0.1711	1.3894	0.8460	4	0.1687
5	-0.1703	2.6136	0.7593	5	-0.1845
6	-0.1765	3.9749	0.6801	6	-0.1579
7	-0.1360	4.8133	0.6827	7	-0.1472
8	0.0467	4.9161	0.7665	8	-0.0100
9	-0.0213	4.9384	0.8396	9	0.0114
10	-0.2522	8.1829	0.6110	10	-0.2641
11	-0.0979	8.6929	0.6502	11	-0.1363
12	0.0172	8.7095	0.7275	12	-0.1222
13	0.1561	10.1298	0.6833	13	0.0939
14	-0.1748	12.0000	0.6063	14	-0.1706
15	0.0369	12.0877	0.6724	15	-0.0497
16	0.0725	12.4447	0.7128	16	-0.0823
17	0.2513	16.9925	0.4549	17	0.1026
18	0.0032	16.9933	0.5236	18	0.0750
19	-0.0435	17.1481	0.5798	19	-0.0996
20	0.0121	17.1608	0.6425	20	-0.0688
21	-0.0886	17.9007	0.6553	21	-0.3092
22	-0.0593	18.2588	0.6905	22	-0.0309
23	-0.0107	18.2716	0.7426	23	0.1056
24	-0.0284	18.3706	0.7847	24	-0.0856
25	0.0213	18.4321	0.8235	25	-0.0164

Time Series Denmark 05



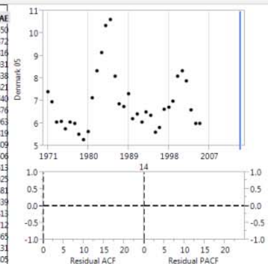
Mean	6.8955571
Std	1.26867
N	35
Zero Mean ADF	-0.613838
Single Mean ADF	-1.834129
Trend ADF	-1.799129

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.7926	23.9282	<.0001*	1	0.7926
2	0.4416	31.5818	<.0001*	2	-0.5019
3	0.1286	32.2513	<.0001*	3	0.0026
4	-0.1003	32.6717	<.0001*	4	-0.1173
5	-0.2884	36.2621	<.0001*	5	-0.2412
6	-0.3792	42.6839	<.0001*	6	0.0714
7	-0.3861	49.5798	<.0001*	7	-0.1329
8	-0.3537	55.5801	<.0001*	8	-0.1182
9	-0.3515	61.7349	<.0001*	9	-0.2364
10	-0.3568	68.3307	<.0001*	10	-0.1549
11	-0.2809	72.5872	<.0001*	11	0.1077
12	-0.1412	73.7098	<.0001*	12	-0.0933
13	-0.0079	73.7135	<.0001*	13	-0.0634
14	0.0800	74.1084	<.0001*	14	-0.1075
15	0.1971	76.6235	<.0001*	15	0.1641
16	0.2905	82.3761	<.0001*	16	-0.0851
17	0.3181	89.6583	<.0001*	17	0.0097
18	0.2093	92.9937	<.0001*	18	-0.3011
19	0.0536	93.2264	<.0001*	19	-0.1030
20	-0.0649	93.5895	<.0001*	20	0.0121
21	-0.1166	94.8479	<.0001*	21	-0.0350
22	-0.1157	96.1814	<.0001*	22	0.1215
23	-0.0858	96.9764	<.0001*	23	-0.1980
24	-0.0471	97.2371	<.0001*	24	-0.0627
25	-0.0162	97.2710	<.0001*	25	0.0260

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	32	0.4585365	76.489463	81.155508	0.736	70.489463	0.229334	7.671349	0.533550
☐	☐	ARMA(2, 1)	31	0.4156605	76.513482	82.734874	0.752	68.513482	0.226597	7.514791	0.518472
☐	☐	MA(2)	32	0.4704325	77.881807	82.547851	0.726	71.881807	0.114321	7.758730	0.541816
☐	☐	ARMA(1, 2)	31	0.4696423	78.361364	84.582756	0.737	70.361364	0.089948	7.561713	0.526031
☐	☐	ARIMA(2, 1, 1	30	0.4897994	78.644861	84.750303	0.719	70.644861	0.078060	7.973743	0.553638
☐	☐	ARMA(1, 1)	32	0.5022575	79.458515	84.124559	0.711	73.458515	0.051969	7.875001	0.552621
☐	☐	ARMA(2, 2)	30	0.4731704	79.673822	87.450562	0.743	69.673822	0.046665	7.294490	0.506740
☐	☐	IMA(1, 1)	32	0.584329	80.323449	83.376170	0.666	76.323449	0.033723	8.300910	0.573476
☐	☐	ARIMA(1, 1, 2	30	0.5350994	80.887212	86.992654	0.698	72.887212	0.025440	8.101044	0.565963
☐	☐	ARI(1, 1)	32	0.5980986	81.092894	84.145615	0.658	77.092894	0.022953	8.378205	0.578819
☐	☐	ARI(2, 1)	31	0.5874833	81.498741	86.077822	0.674	75.498741	0.018738	8.147636	0.562809
☐	☐	IMA(1, 2)	31	0.5958176	81.963935	86.543017	0.670	75.963935	0.014849	8.271740	0.570606
☐	☐	ARIMA(1, 1, 1	31	0.5999588	82.161729	86.740811	0.668	76.161729	0.013451	8.310196	0.573613
☐	☐	ARIMA(2, 1, 2	29	0.5227979	83.028531	90.660334	0.699	73.028531	0.008720	7.634814	0.530925
☐	☐	IMA(2, 2)	30	0.6230482	83.934769	88.424292	0.639	77.934769	0.005543	8.667727	0.598681
☐	☐	I(1)	33	0.6738716	84.052484	85.578845	0.603	82.052484	0.005226	8.659579	0.612339
☐	☐	ARIMA(1, 2, 1	30	0.6385103	84.408698	88.898220	0.633	78.408698	0.004374	8.737934	0.602413
☐	☐	AR(1)	33	0.6145896	85.191608	88.302304	0.637	81.191608	0.002957	8.435569	0.603712
☐	☐	ARIMA(2, 2, 1	29	0.6288678	85.209499	91.195529	0.647	77.209499	0.002930	8.571490	0.590565
☐	☐	ARIMA(1, 2, 2	29	0.6416513	85.618009	91.604040	0.642	77.618009	0.002389	8.698993	0.599131
☐	☐	ARIMA(2, 2, 2	28	0.6706395	88.208086	95.690624	0.635	78.208086	0.000654	8.844677	0.609405
☐	☐	IMA(2, 1)	31	0.8125335	89.117347	92.110362	0.549	85.117347	0.000415	9.329107	0.647205
☐	☐	I(2)	32	0.867347	89.938046	91.434553	0.505	87.938046	0.000276	11.498384	0.781128
☐	☐	ARI(2, 2)	30	0.8249634	90.346070	94.835593	0.557	84.34607	0.000225	10.172764	0.693805
☐	☐	ARI(1, 2)	31	0.8688182	90.975137	93.968152	0.519	86.975137	0.000164	10.890737	0.742685
☐	☐	MA(1)	33	0.7595105	92.464986	95.575682	0.552	88.464986	0.000078	9.964163	0.701018
☐	☐	ARIMA(0, 0, 0	34	1.6568625	117.98354	119.53888	0.000	115.98354	0.000000	13.651875	0.972358



Model: AR(2)

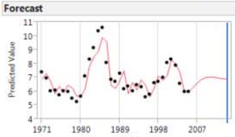
Model Summary

DF	32	Stable	Yes
Sum of Squared Errors	14.6731665	Invertible	Yes
Variance Estimate	0.45853645		
Standard Deviation	0.6771532		
Akaike's 'A' Information Criterion	76.4894634		
Schwarz's Bayesian Criterion	81.1555076		
RSquare	0.73581335		
RSquare Adj	0.71930169		
MAPE	7.67134912		
MAE	0.53354986		
-2LogLikelihood	70.4894634		

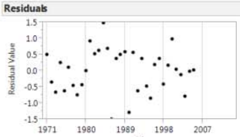
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.197096	0.1405850	8.52	<.0001*	2.12586452
AR2	2	-0.504759	0.1395067	-3.62	0.0010*	
Intercept	0	6.909717	0.3498560	19.75	<.0001*	

Forecast

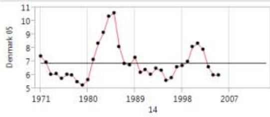


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0105	0.0042	0.9484	1	0.0105
2	-0.0637	0.1633	0.9216	2	-0.0638
3	-0.0324	0.2057	0.9767	3	-0.0311
4	0.1715	1.4338	0.8383	4	0.1689
5	-0.1687	2.6630	0.7518	5	-0.1829
6	-0.1761	4.0481	0.6702	6	-0.1573
7	-0.1366	4.9115	0.6708	7	-0.1481
8	0.0473	5.0188	0.7556	8	-0.0098
9	-0.0211	5.0410	0.8307	9	0.0106
10	-0.2538	8.3783	0.5919	10	-0.2654
11	-0.0988	8.9048	0.6307	11	-0.1366
12	0.0177	8.9225	0.7095	12	-0.1224
13	0.1550	10.3367	0.6662	13	0.0918
14	-0.1741	12.2058	0.5898	14	-0.1700
15	0.0350	12.2852	0.6573	15	-0.0522
16	0.0732	12.6504	0.6981	16	-0.0823
17	0.2520	17.2207	0.4395	17	0.1022
18	0.0036	17.2217	0.5079	18	0.0739
19	-0.0457	17.3910	0.5634	19	-0.1015
20	0.0132	17.4060	0.6265	20	-0.0695
21	-0.0861	18.0920	0.6432	21	-0.3077
22	-0.0582	18.4290	0.6803	22	-0.0323
23	-0.0097	18.4391	0.7333	23	0.1060
24	-0.0268	18.5236	0.7769	24	-0.0853
25	0.0213	18.5826	0.8167	25	-0.0184

Time Series Denmark 05



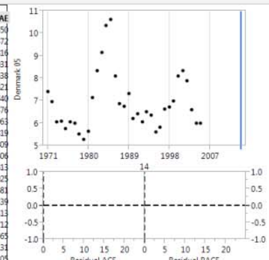
Mean	6.8955571
Std	1.26867
N	35
Zero Mean ADF	-0.613838
Single Mean ADF	-1.834129
Trend ADF	-1.799129

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.7926	23.9282	<.0001*	1	0.7926
2	0.4416	31.5818	<.0001*	2	-0.5019
3	0.1286	32.2513	<.0001*	3	0.0026
4	-0.1003	32.6717	<.0001*	4	-0.1173
5	-0.2884	36.2621	<.0001*	5	-0.2412
6	-0.3792	42.6839	<.0001*	6	0.0714
7	-0.3861	49.5798	<.0001*	7	-0.1329
8	-0.3537	55.5801	<.0001*	8	-0.1182
9	-0.3515	61.7349	<.0001*	9	-0.2364
10	-0.3568	68.3307	<.0001*	10	-0.1549
11	-0.2809	72.5872	<.0001*	11	0.1077
12	-0.1412	73.7098	<.0001*	12	-0.0933
13	-0.0079	73.7135	<.0001*	13	-0.0634
14	0.0800	74.1084	<.0001*	14	-0.1075
15	0.1971	76.6235	<.0001*	15	0.1641
16	0.2905	82.3761	<.0001*	16	-0.0851
17	0.3181	89.6583	<.0001*	17	0.0097
18	0.2093	92.9937	<.0001*	18	-0.3011
19	0.0536	93.2264	<.0001*	19	-0.1030
20	-0.0649	93.5895	<.0001*	20	0.0121
21	-0.1166	94.8479	<.0001*	21	-0.0350
22	-0.1157	96.1814	<.0001*	22	0.1215
23	-0.0858	96.9764	<.0001*	23	-0.1980
24	-0.0471	97.2371	<.0001*	24	-0.0627
25	-0.0162	97.2710	<.0001*	25	0.0260

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	32	0.4585365	76.489463	81.155508	0.736	70.489463	0.229334	7.671349	0.533550
☐	☐	ARMA(2, 1)	31	0.4156605	76.513482	82.734874	0.752	68.513482	0.226597	7.514791	0.518472
☐	☐	MA(2)	32	0.4704325	77.881807	82.547851	0.726	71.881807	0.114321	7.758730	0.541816
☐	☐	ARMA(1, 2)	31	0.4696423	78.361364	84.582756	0.737	70.361364	0.089948	7.561713	0.526031
☐	☐	ARIMA(2, 1, 1	30	0.4897994	78.644861	84.750303	0.719	70.644861	0.078060	7.973743	0.553638
☐	☐	ARMA(1, 1)	32	0.5022575	79.458515	84.124559	0.711	73.458515	0.051969	7.875001	0.552621
☐	☐	ARMA(2, 2)	30	0.4731704	79.673822	87.450562	0.743	69.673822	0.046665	7.294490	0.506740
☐	☐	IMA(1, 1)	32	0.584329	80.323449	83.376170	0.666	76.323449	0.033723	8.300910	0.573476
☐	☐	ARIMA(1, 1, 2	30	0.5350994	80.887212	86.992654	0.698	72.887212	0.025440	8.101044	0.565963
☐	☐	ARI(1, 1)	32	0.5980986	81.092894	84.145615	0.658	77.092894	0.022953	8.378205	0.578819
☐	☐	ARI(2, 1)	31	0.5874833	81.498741	86.077822	0.674	75.498741	0.018738	8.147636	0.562809
☐	☐	IMA(1, 2)	31	0.5958176	81.963935	86.543017	0.670	75.963935	0.014849	8.271740	0.570606
☐	☐	ARIMA(1, 1, 1	31	0.5999588	82.161729	86.740811	0.668	76.161729	0.013451	8.310196	0.573613
☐	☐	ARIMA(2, 1, 2	29	0.5227979	83.028531	90.660334	0.699	73.028531	0.008720	7.634814	0.530925
☐	☐	IMA(2, 2)	30	0.6230482	83.934769	88.424292	0.639	77.934769	0.005543	8.667727	0.598681
☐	☐	I(1)	33	0.6738716	84.052484	85.578845	0.603	82.052484	0.005226	8.659579	0.612339
☐	☐	ARIMA(1, 2, 1	30	0.6385103	84.408698	88.898220	0.633	78.408698	0.004374	8.737934	0.602413
☐	☐	AR(1)	33	0.6145896	85.191608	88.302304	0.637	81.191608	0.002957	8.435569	0.603712
☐	☐	ARIMA(2, 2, 1	29	0.6288678	85.209499	91.195529	0.647	77.209499	0.002930	8.571490	0.590565
☐	☐	ARIMA(1, 2, 2	29	0.6416513	85.618009	91.604040	0.642	77.618009	0.002389	8.698993	0.599131
☐	☐	ARIMA(2, 2, 2	28	0.6706395	88.208086	95.690624	0.635	78.208086	0.000654	8.844677	0.609405
☐	☐	IMA(2, 1)	31	0.8125335	89.117347	92.110362	0.549	85.117347	0.000415	9.329107	0.647205
☐	☐	I(2)	32	0.867347	89.938046	91.434553	0.505	87.938046	0.000276	11.498384	0.781128
☐	☐	ARI(2, 2)	30	0.8249634	90.346070	94.835593	0.557	84.34607	0.000225	10.172764	0.693805
☐	☐	ARI(1, 2)	31	0.8688182	90.975137	93.968152	0.519	86.975137	0.000164	10.890737	0.742685
☐	☐	MA(1)	33	0.7595105	92.464986	95.575682	0.552	88.464986	0.000078	9.964163	0.701018
☐	☐	ARIMA(0, 0, 0	34	1.6568625	117.98354	119.53888	0.000	115.98354	0.000000	13.651875	0.972358



Model: AR(2)

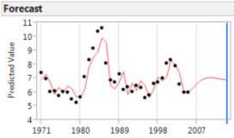
Model Summary

DF	32	Stable	Yes
Sum of Squared Errors	14.6731665	Invertible	Yes
Variance Estimate	0.45853645		
Standard Deviation	0.6771532		
Akaike's 'A' Information Criterion	76.4894634		
Schwarz's Bayesian Criterion	81.1555076		
RSquare	0.73581335		
RSquare Adj	0.71930169		
MAPE	7.67134912		
MAE	0.53354986		
-2LogLikelihood	70.4894634		

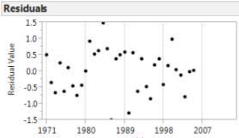
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.197096	0.1405850	8.52	<.0001*	2.12586452
AR2	2	-0.504759	0.1395067	-3.62	0.0010*	
Intercept	0	6.909717	0.3498560	19.75	<.0001*	

Forecast

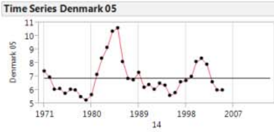


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0105	0.0042	0.9484	1	0.0105
2	-0.0637	0.1633	0.9216	2	-0.0638
3	-0.0324	0.2057	0.9767	3	-0.0311
4	0.1715	1.4338	0.8383	4	0.1689
5	-0.1687	2.6630	0.7518	5	-0.1829
6	-0.1761	4.0481	0.6702	6	-0.1573
7	-0.1366	4.9115	0.6708	7	-0.1481
8	0.0473	5.0188	0.7556	8	-0.0098
9	-0.0211	5.0410	0.8307	9	0.0106
10	-0.2538	8.3783	0.5919	10	-0.2654
11	-0.0988	8.9048	0.6307	11	-0.1366
12	0.0177	8.9225	0.7095	12	-0.1224
13	0.1550	10.3367	0.6662	13	0.0918
14	-0.1741	12.2058	0.5898	14	-0.1700
15	0.0350	12.2852	0.6573	15	-0.0522
16	0.0732	12.6504	0.6981	16	-0.0823
17	0.2520	17.2207	0.4395	17	0.1022
18	0.0036	17.2217	0.5079	18	0.0739
19	-0.0457	17.3910	0.5634	19	-0.1015
20	0.0132	17.4060	0.6265	20	-0.0695
21	-0.0861	18.0920	0.6432	21	-0.3077
22	-0.0582	18.4290	0.6803	22	-0.0323
23	-0.0097	18.4391	0.7333	23	0.1060
24	-0.0268	18.5236	0.7769	24	-0.0853
25	0.0213	18.5826	0.8167	25	-0.0184

Time Series Denmark 05



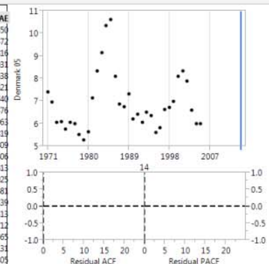
Mean	6.8955571
Std	1.26867
N	35
Zero Mean ADF	-0.613838
Single Mean ADF	-1.834129
Trend ADF	-1.799129

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.7926	23.9282	<.0001*	1	0.7926
2	0.4416	31.5818	<.0001*	2	-0.5019
3	0.1286	32.2513	<.0001*	3	0.0026
4	-0.1003	32.6717	<.0001*	4	-0.1173
5	-0.2884	36.2621	<.0001*	5	-0.2412
6	-0.3792	42.6839	<.0001*	6	0.0714
7	-0.3861	49.5798	<.0001*	7	-0.1329
8	-0.3537	55.5801	<.0001*	8	-0.1182
9	-0.3515	61.7349	<.0001*	9	-0.2364
10	-0.3568	68.3307	<.0001*	10	-0.1549
11	-0.2809	72.5872	<.0001*	11	0.1077
12	-0.1412	73.7098	<.0001*	12	-0.0933
13	-0.0079	73.7135	<.0001*	13	-0.0634
14	0.0800	74.1084	<.0001*	14	-0.1075
15	0.1971	76.6235	<.0001*	15	0.1641
16	0.2905	82.3761	<.0001*	16	-0.0851
17	0.3181	89.6583	<.0001*	17	0.0097
18	0.2093	92.9937	<.0001*	18	-0.3011
19	0.0536	93.2264	<.0001*	19	-0.1030
20	-0.0649	93.5895	<.0001*	20	0.0121
21	-0.1166	94.8479	<.0001*	21	-0.0350
22	-0.1157	96.1814	<.0001*	22	0.1215
23	-0.0858	96.9764	<.0001*	23	-0.1980
24	-0.0471	97.2371	<.0001*	24	-0.0627
25	-0.0162	97.2710	<.0001*	25	0.0260

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	32	0.4585365	76.489463	81.155508	0.736	70.489463	0.229334	7.671349	0.533550
☐	☐	ARMA(2, 1)	31	0.4156605	76.513482	82.734874	0.752	68.513482	0.226597	7.514791	0.518472
☐	☐	MA(2)	32	0.4704325	77.881807	82.547851	0.726	71.881807	0.114321	7.758730	0.541816
☐	☐	ARMA(1, 2)	31	0.4696423	78.361364	84.582756	0.737	70.361364	0.089948	7.561713	0.526031
☐	☐	ARIMA(2, 1, 1	30	0.4897994	78.644861	84.750303	0.719	70.644861	0.078060	7.973743	0.553638
☐	☐	ARMA(1, 1)	32	0.5022575	79.458515	84.124559	0.711	73.458515	0.051969	7.875001	0.552621
☐	☐	ARMA(2, 2)	30	0.4731704	79.673822	87.450562	0.743	69.673822	0.046665	7.294490	0.506740
☐	☐	IMA(1, 1)	32	0.584329	80.323449	83.376170	0.666	76.323449	0.033723	8.300910	0.573476
☐	☐	ARIMA(1, 1, 2	30	0.5350994	80.887212	86.992654	0.698	72.887212	0.025440	8.101044	0.565963
☐	☐	ARI(1, 1)	32	0.5980986	81.092894	84.145615	0.658	77.092894	0.022953	8.378205	0.578819
☐	☐	ARI(2, 1)	31	0.5874833	81.498741	86.077822	0.674	75.498741	0.018738	8.147636	0.562809
☐	☐	IMA(1, 2)	31	0.5958176	81.963935	86.543017	0.670	75.963935	0.014849	8.271740	0.570606
☐	☐	ARIMA(1, 1, 1	31	0.5999588	82.161729	86.740811	0.668	76.161729	0.013451	8.310196	0.573613
☐	☐	ARIMA(2, 1, 2	29	0.5227979	83.028531	90.660334	0.699	73.028531	0.008720	7.634814	0.530925
☐	☐	IMA(2, 2)	30	0.6230482	83.934769	88.424292	0.639	77.934769	0.005543	8.667727	0.598681
☐	☐	I(1)	33	0.6738716	84.052484	85.578845	0.603	82.052484	0.005226	8.659579	0.612339
☐	☐	ARIMA(1, 2, 1	30	0.6385103	84.408698	88.898220	0.633	78.408698	0.004374	8.737934	0.602413
☐	☐	AR(1)	33	0.6145896	85.191608	88.302304	0.637	81.191608	0.002957	8.435569	0.603712
☐	☐	ARIMA(2, 2, 1	29	0.6288678	85.209499	91.195529	0.647	77.209499	0.002930	8.571490	0.590565
☐	☐	ARIMA(1, 2, 2	29	0.6416513	85.618009	91.604040	0.642	77.618009	0.002389	8.698993	0.599131
☐	☐	ARIMA(2, 2, 2	28	0.6706395	88.208086	95.690624	0.635	78.208086	0.000654	8.844677	0.609405
☐	☐	IMA(2, 1)	31	0.8125335	89.117347	92.110362	0.549	85.117347	0.000415	9.329107	0.647205
☐	☐	I(2)	32	0.867347	89.938046	91.434553	0.505	87.938046	0.000276	11.498384	0.781128
☐	☐	ARI(2, 2)	30	0.8249634	90.346070	94.835593	0.557	84.34607	0.000225	10.172764	0.693805
☐	☐	ARI(1, 2)	31	0.8688182	90.975137	93.968152	0.519	86.975137	0.000164	10.890737	0.742685
☐	☐	MA(1)	33	0.7595105	92.464986	95.575682	0.552	88.464986	0.000078	9.964163	0.701018
☐	☐	ARIMA(0, 0, 0	34	1.6568625	117.98354	119.53888	0.000	115.98354	0.000000	13.651875	0.972358



Model: AR(2)

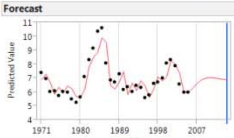
Model Summary

DF	32	Stable	Yes
Sum of Squared Errors	14.6731665	Invertible	Yes
Variance Estimate	0.45853645		
Standard Deviation	0.6771532		
Akaike's 'A' Information Criterion	76.4894634		
Schwarz's Bayesian Criterion	81.1555076		
RSquare	0.73581335		
RSquare Adj	0.71930169		
MAPE	7.67134912		
MAE	0.53354986		
-2LogLikelihood	70.4894634		

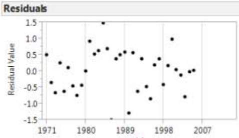
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.197096	0.1405850	8.52	<.0001*	2.12586452
AR2	2	-0.504759	0.1395067	-3.62	0.0010*	
Intercept	0	6.909717	0.3498560	19.75	<.0001*	

Forecast

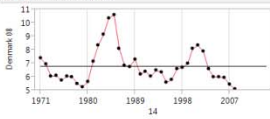


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0105	0.0042	0.9484	1	0.0105
2	-0.0637	0.1633	0.9216	2	-0.0638
3	-0.0324	0.2057	0.9767	3	-0.0311
4	0.1715	1.4338	0.8383	4	0.1689
5	-0.1687	2.6630	0.7518	5	-0.1829
6	-0.1761	4.0481	0.6702	6	-0.1573
7	-0.1366	4.9115	0.6708	7	-0.1481
8	0.0473	5.0188	0.7556	8	-0.0098
9	-0.0211	5.0410	0.8307	9	0.0106
10	-0.2538	8.3783	0.5919	10	-0.2654
11	-0.0988	8.9048	0.6307	11	-0.1366
12	0.0177	8.9225	0.7095	12	-0.1224
13	0.1550	10.3367	0.6662	13	0.0918
14	-0.1741	12.2058	0.5898	14	-0.1700
15	0.0350	12.2852	0.6573	15	-0.0522
16	0.0732	12.6504	0.6981	16	-0.0823
17	0.2520	17.2207	0.4395	17	0.1022
18	0.0036	17.2217	0.5079	18	0.0739
19	-0.0457	17.3910	0.5634	19	-0.1015
20	0.0132	17.4060	0.6265	20	-0.0695
21	-0.0861	18.0920	0.6432	21	-0.3077
22	-0.0582	18.4290	0.6803	22	-0.0323
23	-0.0097	18.4391	0.7333	23	0.1060
24	-0.0268	18.5236	0.7769	24	-0.0853
25	0.0213	18.5826	0.8167	25	-0.0184

Time Series Denmark 08



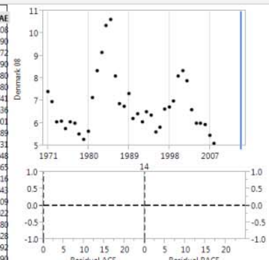
Mean	6.7846447
Std	1.2789292
N	38
Zero Mean ADF	-0.775955
Single Mean ADF	-1.681547
Trend ADF	-1.683847

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.7914	25.7272	<.0001*	1	0.7914
2	0.4598	34.6551	<.0001*	2	-0.4453
3	0.1687	35.8918	<.0001*	3	-0.0161
4	-0.0696	36.1081	<.0001*	4	-0.1747
5	-0.2911	40.0121	<.0001*	5	-0.2524
6	-0.4164	48.2486	<.0001*	6	0.0302
7	-0.4135	56.6334	<.0001*	7	-0.0008
8	-0.3473	62.7438	<.0001*	8	-0.0941
9	-0.3044	67.6018	<.0001*	9	-0.1886
10	-0.2844	71.9934	<.0001*	10	-0.1620
11	-0.1911	74.0498	<.0001*	11	0.1239
12	-0.0502	74.1972	<.0001*	12	0.0046
13	0.0545	74.3775	<.0001*	13	-0.0663
14	0.1120	75.1714	<.0001*	14	-0.0334
15	0.2133	78.1789	<.0001*	15	0.1664
16	0.3042	84.5705	<.0001*	16	-0.0179
17	0.3076	91.4197	<.0001*	17	-0.0167
18	0.1985	94.4148	<.0001*	18	-0.1389
19	0.0368	94.5232	<.0001*	19	-0.1729
20	-0.0750	94.9987	<.0001*	20	0.1117
21	-0.1917	98.2843	<.0001*	21	-0.1847
22	-0.2805	105.760	<.0001*	22	0.0657
23	-0.3036	115.101	<.0001*	23	-0.0870
24	-0.2267	120.679	<.0001*	24	-0.0160
25	-0.1303	122.665	<.0001*	25	0.0086

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	35	0.4438907	81.519464	86.432223	0.745	75.519464	0.230484	7.893414	0.539108
☐	☐	ARMA(1, 2)	34	0.449029	83.018944	89.569289	0.748	75.018944	0.108901	7.671546	0.525390
☐	☐	ARIMA(2, 1, 1	33	0.4653302	83.095154	89.538826	0.735	75.095154	0.104829	7.998299	0.547272
☐	☐	MA(2)	35	0.4626272	83.507313	88.420071	0.732	77.507313	0.085307	7.984903	0.548790
☐	☐	ARMA(2, 1)	34	0.4569213	83.517834	90.068178	0.745	75.517834	0.084859	7.889389	0.538880
☐	☐	ARMA(1, 1)	35	0.4780773	84.153397	89.066155	0.725	78.153397	0.061757	7.903813	0.545380
☐	☐	ARMA(2, 2)	33	0.4500772	84.175417	92.363348	0.754	74.175417	0.061081	7.352508	0.502741
☐	☐	IMA(1, 1)	35	0.540098	84.320399	87.542235	0.693	80.320399	0.056810	7.897892	0.541636
☐	☐	ARIMA(1, 1, 2	33	0.5003794	85.055899	91.499571	0.719	77.055899	0.039329	7.812560	0.540001
☐	☐	ARI(1, 1)	35	0.552897	85.165125	88.386960	0.686	81.165125	0.037239	7.963861	0.546189
☐	☐	ARI(2, 1)	34	0.5423151	85.468157	90.300910	0.701	79.468157	0.032003	7.772138	0.532731
☐	☐	IMA(1, 2)	34	0.5489408	85.909994	90.742748	0.697	79.909994	0.025660	7.903693	0.541048
☐	☐	ARIMA(1, 1, 1	34	0.5528922	86.135421	90.968174	0.695	80.135421	0.022924	7.900376	0.541465
☐	☐	ARIMA(2, 1, 2	32	0.5379122	87.323363	95.377952	0.719	77.323363	0.012657	7.688918	0.526316
☐	☐	IMA(2, 2)	33	0.5712002	87.996894	92.747451	0.669	81.996894	0.009038	8.168566	0.560843
☐	☐	ARIMA(1, 2, 1	33	0.5858907	88.579222	93.329779	0.664	82.579222	0.006755	8.264578	0.566109
☐	☐	I(1)	36	0.625816	88.645829	90.256747	0.635	86.645829	0.006534	8.352223	0.584922
☐	☐	ARIMA(2, 2, 1	32	0.574922	89.223479	95.557555	0.676	81.223479	0.004895	8.106360	0.555180
☐	☐	ARIMA(1, 2, 2	32	0.5864147	89.673000	96.007076	0.672	81.673	0.003910	8.218134	0.562628
☐	☐	AR(1)	36	0.5857718	90.542091	93.817264	0.655	86.542091	0.002532	8.430034	0.593092
☐	☐	ARIMA(2, 2, 2	31	0.6202229	92.499780	100.41737	0.665	82.49978	0.000951	8.257966	0.565890
☐	☐	IMA(2, 1)	34	0.6597157	92.742650	95.909687	0.606	88.74265	0.000842	8.733806	0.607590
☐	☐	ARI(2, 2)	33	0.7548764	95.097406	99.847962	0.595	89.097406	0.000260	9.632508	0.653318
☐	☐	I(2)	35	0.7996332	95.099744	96.683263	0.547	93.099744	0.000259	10.886385	0.734619
☐	☐	ARI(1, 2)	34	0.7987417	96.044767	99.211805	0.560	92.044767	0.000162	10.283052	0.696965
☐	☐	MA(1)	36	0.7564804	100.05084	103.32601	0.558	96.050838	0.000022	10.160448	0.702770
☐	☐	ARIMA(0, 0, 0	37	1.6798669	128.53709	130.17468	0.000	126.53709	0.000000	13.939386	0.974804



Model: AR(2)

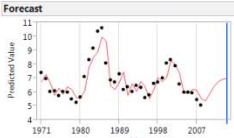
Model Summary

DF	35	Stable	Yes
Sum of Squared Errors	15.5361739	Invertible	Yes
Variance Estimate	0.44389068		
Standard Deviation	0.66625122		
Akaike's 'A' Information Criterion	81.519464		
Schwarz's Bayesian Criterion	86.4322225		
RSquare	0.74470843		
RSquare Adj	0.73012034		
MAPE	7.89341447		
MAE	0.53910786		
-2LogLikelihood	75.519464		

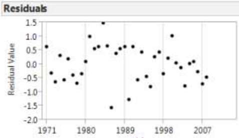
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.222856	0.1372555	8.91	<.0001*	1.88752359
AR2	2	-0.501756	0.1375027	-3.65	0.0009*	
Intercept	0	6.767757	0.3651200	18.54	<.0001*	

Forecast

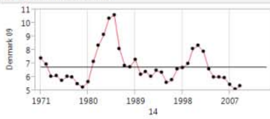


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0178	0.0130	0.9092	1	0.0178
2	-0.0880	0.3403	0.8435	2	-0.0884
3	-0.0301	0.3795	0.9444	3	-0.0270
4	0.1983	2.1380	0.7104	4	0.1933
5	-0.1201	2.8025	0.7304	5	-0.1391
6	-0.1722	4.2109	0.6482	6	-0.1420
7	-0.1618	5.4939	0.5999	7	-0.1711
8	0.0414	5.5809	0.6941	8	-0.0225
9	0.0095	5.5856	0.7806	9	0.0287
10	-0.2308	8.4777	0.5823	10	-0.2203
11	-0.0860	8.8943	0.6317	11	-0.0698
12	0.0703	9.1830	0.6872	12	-0.0350
13	0.1978	11.5629	0.5638	13	0.1406
14	-0.1622	13.2282	0.5086	14	-0.1348
15	0.0134	13.2400	0.5838	15	0.0021
16	0.0837	13.7243	0.6192	16	-0.0109
17	0.2702	19.0102	0.3279	17	0.1621
18	0.0034	19.0111	0.3911	18	0.1002
19	-0.1103	19.9840	0.3955	19	-0.1048
20	0.0140	20.0005	0.4579	20	-0.0000
21	-0.0376	20.1268	0.5132	21	-0.2059
22	-0.0596	20.4643	0.5540	22	0.0273
23	-0.1066	21.6159	0.5435	23	0.0514
24	-0.1119	22.9763	0.5212	24	-0.1539
25	-0.0403	23.1665	0.5678	25	-0.0544

Time Series Denmark 09



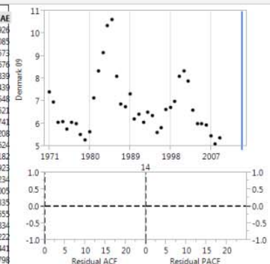
Mean	6.7480487
Std	1.2824243
N	39
Zero Mean ADF	-0.737695
Single Mean ADF	-1.758042
Trend ADF	-1.777192

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8042	27.2168	<.0001*	1	0.8042
2	0.4760	37.0076	<.0001*	2	-0.4837
3	0.1839	38.5101	<.0001*	3	0.0183
4	-0.0473	38.6125	<.0001*	4	-0.1573
5	-0.2609	41.8137	<.0001*	5	-0.2596
6	-0.3945	49.3563	<.0001*	6	0.0348
7	-0.4203	58.1845	<.0001*	7	-0.0492
8	-0.3660	65.0932	<.0001*	8	-0.0389
9	-0.3192	70.5250	<.0001*	9	-0.1972
10	-0.2753	74.7054	<.0001*	10	-0.0594
11	-0.1789	76.5330	<.0001*	11	0.0734
12	-0.0411	76.6330	<.0001*	12	-0.0047
13	0.0770	76.9981	<.0001*	13	0.0019
14	0.1357	78.1765	<.0001*	14	-0.0879
15	0.2156	81.2738	<.0001*	15	0.2225
16	0.3002	87.5397	<.0001*	16	-0.0019
17	0.3137	94.6908	<.0001*	17	-0.0499
18	0.2002	97.7433	<.0001*	18	-0.1622
19	0.0482	97.9288	<.0001*	19	-0.0340
20	-0.0847	98.5330	<.0001*	20	-0.0446
21	-0.1850	101.573	<.0001*	21	-0.0242
22	-0.2730	108.583	<.0001*	22	-0.0395
23	-0.3230	119.011	<.0001*	23	-0.1173
24	-0.3047	128.907	<.0001*	24	-0.0327
25	-0.2074	133.820	<.0001*	25	0.0945

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	36	0.4315239	82.450976	87.441661	0.753	76.450976	0.250656	7.702785	0.525926
☐	☐	ARMA(1, 2)	35	0.4362091	83.937464	90.591711	0.756	75.937464	0.119204	7.495918	0.513085
☐	☐	ARIMA(2, 1, 1	34	0.4519296	84.110047	90.660391	0.743	76.110047	0.109349	7.858976	0.536573
☐	☐	ARMA(2, 1)	35	0.443829	84.449207	91.103454	0.753	76.449207	0.092293	7.698356	0.525676
☐	☐	MA(2)	36	0.4519158	84.668138	89.658822	0.739	78.668138	0.082723	7.921409	0.542839
☐	☐	ARMA(2, 2)	34	0.4368349	85.061857	93.379665	0.761	75.061857	0.067941	7.175235	0.490439
☐	☐	ARMA(1, 1)	36	0.4647631	85.158109	90.148794	0.733	79.158109	0.064749	7.704270	0.531548
☐	☐	IMA(1, 1)	36	0.5290091	85.756195	89.031367	0.701	81.756195	0.048013	7.899034	0.538521
☐	☐	ARI(1, 1)	36	0.5429411	86.716731	89.991903	0.693	82.716731	0.029702	7.995948	0.544741
☐	☐	ARI(2, 1)	35	0.5304461	86.859909	91.772667	0.708	80.859909	0.027650	7.779190	0.530208
☐	☐	ARIMA(1, 1, 2	34	0.5180554	87.201350	93.751694	0.722	79.20135	0.023310	7.719004	0.522624
☐	☐	IMA(1, 2)	35	0.5382352	87.399136	92.311894	0.704	81.399136	0.021115	7.892744	0.537182
☐	☐	ARIMA(1, 1, 1	35	0.541611	87.599430	92.512188	0.702	81.59943	0.019103	7.911703	0.538923
☐	☐	ARIMA(2, 1, 2	33	0.4719922	88.036139	96.224070	0.729	78.036139	0.015356	7.270065	0.499234
☐	☐	IMA(2, 2)	34	0.5596864	89.550926	94.383680	0.677	83.550926	0.007200	8.196864	0.559005
☐	☐	I(1)	37	0.611794	90.154267	91.791853	0.645	88.154267	0.005325	8.288370	0.577335
☐	☐	ARIMA(1, 2, 1	34	0.5752038	90.241223	95.073977	0.671	84.241223	0.005099	8.301064	0.564655
☐	☐	ARIMA(2, 2, 1	33	0.5626411	90.765718	97.209390	0.683	82.765718	0.003922	8.125012	0.552834
☐	☐	ARIMA(1, 2, 2	33	0.5744617	91.258531	97.702203	0.679	83.258531	0.003066	8.236757	0.560222
☐	☐	AR(1)	37	0.5698765	91.779464	95.106588	0.666	87.779464	0.002363	8.224133	0.578441
☐	☐	ARIMA(2, 2, 2	32	0.599669	94.028300	102.08289	0.672	84.0283	0.000768	8.431609	0.572798
☐	☐	IMA(2, 1)	35	0.6454733	94.385397	97.607233	0.615	90.385397	0.000642	8.681622	0.599975
☐	☐	ARI(2, 2)	34	0.7402854	96.944856	101.77761	0.603	90.944856	0.000179	9.589782	0.646993
☐	☐	I(2)	36	0.7877753	97.161620	98.772538	0.554	95.16162	0.000160	10.891529	0.731041
☐	☐	ARI(1, 2)	35	0.7873879	98.128827	101.35066	0.567	94.128827	0.000099	10.307516	0.694561
☐	☐	MA(1)	37	0.7492173	102.23990	105.56702	0.564	98.239901	0.000013	10.154083	0.699406
☐	☐	ARIMA(0, 0, 0	38	1.6878914	132.07988	133.74344	0.000	130.07988	0.000000	14.035977	0.976083



Model: AR(2)

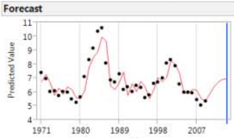
Model Summary

DF	36	Stable	Yes
Sum of Squared Errors	15.5348599	Invertible	Yes
Variance Estimate	0.43152389		
Standard Deviation	0.65690478		
Akaike's 'A' Information Criterion	82.450976		
Schwarz's Bayesian Criterion	87.4416609		
RSquare	0.75259374		
RSquare Adj	0.73884895		
MAPE	7.70278505		
MAE	0.52592639		
-2LogLikelihood	76.450976		

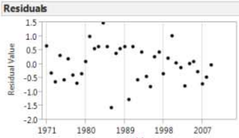
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.224207	0.1345283	9.10	<.0001*	1.88209217
AR2	2	-0.502383	0.1358525	-3.70	0.0007*	
Intercept	0	6.765853	0.3566321	18.97	<.0001*	

Forecast

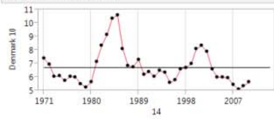


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0169	0.0121	0.9125	1	0.0169
2	-0.0884	0.3495	0.8397	2	-0.0887
3	-0.0302	0.3899	0.9423	3	-0.0272
4	0.1985	2.1904	0.7008	4	0.1934
5	-0.1199	2.8660	0.7206	5	-0.1386
6	-0.1708	4.2804	0.6388	6	-0.1407
7	-0.1610	5.5757	0.5901	7	-0.1705
8	0.0423	5.6680	0.6844	8	-0.0217
9	0.0090	5.6724	0.7722	9	0.0282
10	-0.2308	8.6097	0.5695	10	-0.2205
11	-0.0854	9.0257	0.6195	11	-0.0690
12	0.0700	9.3160	0.6757	12	-0.0351
13	0.1978	11.7215	0.5506	13	0.1416
14	-0.1617	13.3947	0.4957	14	-0.1337
15	0.0133	13.4065	0.5709	15	0.0022
16	0.0829	13.8844	0.6073	16	-0.0110
17	0.2709	19.2183	0.3161	17	0.1634
18	0.0023	19.2187	0.3785	18	0.0995
19	-0.1092	20.1713	0.3843	19	-0.1032
20	0.0135	20.1866	0.4463	20	-0.0004
21	-0.0380	20.3150	0.5014	21	-0.2065
22	-0.0597	20.6498	0.5425	22	0.0279
23	-0.1043	21.7378	0.5361	23	0.0527
24	-0.1123	23.0812	0.5150	24	-0.1537
25	-0.0417	23.2794	0.5613	25	-0.0560

Time Series Denmark 10



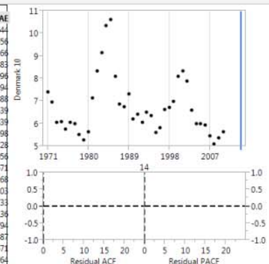
Mean	6.72001
Std	1.2783417
N	40
Zero Mean ADF	-0.696207
Single Mean ADF	-1.828944
Trend ADF	-1.85127

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8127	28.4528	<.0001*	1	0.8127
2	0.4957	39.3172	<.0001*	2	-0.4854
3	0.2041	41.2085	<.0001*	3	0.0005
4	-0.0306	41.2522	<.0001*	4	-0.1407
5	-0.2403	44.0237	<.0001*	5	-0.2371
6	-0.3707	50.8142	<.0001*	6	0.0345
7	-0.4055	59.1840	<.0001*	7	-0.0604
8	-0.3740	66.5278	<.0001*	8	-0.0681
9	-0.3357	72.6336	<.0001*	9	-0.1449
10	-0.2887	77.3026	<.0001*	10	-0.0660
11	-0.1759	79.0948	<.0001*	11	0.1456
12	-0.0366	79.1750	<.0001*	12	-0.0631
13	0.0800	79.5728	<.0001*	13	0.0181
14	0.1499	81.0252	<.0001*	14	-0.0333
15	0.2305	84.5951	<.0001*	15	0.1554
16	0.3004	90.9130	<.0001*	16	0.0370
17	0.3115	98.0011	<.0001*	17	-0.0212
18	0.2080	101.305	<.0001*	18	-0.1888
19	0.0526	101.526	<.0001*	19	-0.0638
20	-0.0738	101.983	<.0001*	20	0.0613
21	-0.1912	105.216	<.0001*	21	-0.1574
22	-0.2676	111.899	<.0001*	22	0.1262
23	-0.3184	121.917	<.0001*	23	-0.2495
24	-0.3217	132.783	<.0001*	24	-0.0410
25	-0.2693	140.904	<.0001*	25	0.0981

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	37	0.4215136	83.515053	88.581691	0.756	77.515053	0.249441	7.606166	0.518644
☐	☐	ARMA(1, 2)	36	0.4260473	85.011155	91.766673	0.759	77.011155	0.118057	7.413623	0.506556
☐	☐	ARIMA(2, 1, 1	35	0.4394158	85.075914	91.730160	0.747	77.075914	0.114296	7.696654	0.525166
☐	☐	ARMA(2, 1)	36	0.4331941	85.513016	92.268534	0.756	77.513016	0.091858	7.601567	0.518383
☐	☐	MA(2)	37	0.4415272	85.871063	90.937701	0.742	79.871063	0.076801	7.817443	0.534996
☐	☐	ARMA(2, 2)	35	0.4254482	86.037247	94.481644	0.765	76.037247	0.070677	7.068593	0.482494
☐	☐	ARMA(1, 1)	37	0.4524826	86.172141	91.238780	0.738	80.172141	0.066068	7.556279	0.520888
☐	☐	IMA(1, 1)	37	0.5154741	86.949990	90.277113	0.706	82.94999	0.044780	7.783361	0.529539
☐	☐	ARIMA(1, 1, 2	35	0.472179	87.168630	93.822876	0.732	79.16863	0.040142	7.531133	0.518839
☐	☐	ARI(1, 1)	37	0.5293538	87.959414	91.286537	0.698	83.959414	0.027033	7.895654	0.536598
☐	☐	ARI(2, 1)	36	0.5159785	87.992245	92.982930	0.713	81.992245	0.026592	7.635486	0.519728
☐	☐	IMA(1, 2)	36	0.523707	88.558927	93.549612	0.709	82.558927	0.020031	7.756726	0.527056
☐	☐	ARIMA(1, 1, 1	36	0.5272223	88.780235	93.770920	0.707	82.780235	0.017933	7.789388	0.529571
☐	☐	ARIMA(2, 1, 2	34	0.509302	89.750365	98.068173	0.730	79.750365	0.011040	7.561891	0.514168
☐	☐	IMA(2, 2)	35	0.5447655	90.809875	95.722633	0.682	84.809875	0.006500	8.084973	0.550103
☐	☐	ARIMA(1, 2, 1	35	0.5599724	91.527896	96.440655	0.676	85.527896	0.004539	8.189235	0.555733
☐	☐	I(1)	38	0.5983689	91.635796	93.299358	0.650	89.635796	0.004301	8.219359	0.570136
☐	☐	ARIMA(2, 2, 1	34	0.5466161	91.965916	98.516261	0.689	83.965916	0.003647	7.991169	0.542794
☐	☐	ARIMA(1, 2, 2	34	0.5584338	92.494427	99.044771	0.684	84.494427	0.002800	8.108336	0.550387
☐	☐	AR(1)	38	0.5548921	92.990628	96.368387	0.672	88.990628	0.002185	8.029695	0.564571
☐	☐	ARIMA(2, 2, 2	33	0.5818777	95.276052	103.46398	0.678	85.276052	0.000697	8.299100	0.562764
☐	☐	IMA(2, 1)	36	0.716449	97.508062	100.78323	0.601	93.508062	0.000228	8.826151	0.601882
☐	☐	ARI(2, 2)	35	0.7198345	98.418987	103.33175	0.610	92.418987	0.000145	9.406723	0.633868
☐	☐	I(2)	37	0.7664938	98.720647	100.35823	0.562	96.720647	0.000124	10.614068	0.712311
☐	☐	ARI(1, 2)	36	0.7657015	99.667393	102.94257	0.575	95.667393	0.000078	10.073703	0.678447
☐	☐	MA(1)	38	0.7380005	104.19820	107.57596	0.567	100.1982	0.000008	10.091369	0.693687
☐	☐	ARIMA(0, 0, 0	39	1.6760589	135.16018	136.84906	0.000	133.16018	0.000000	14.015542	0.972368



Model: AR(2)

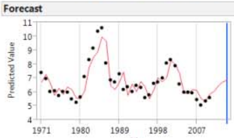
Model Summary

DF	37	Stable	Yes
Sum of Squared Errors	15.5960031	Invertible	Yes
Variance Estimate	0.4215136		
Standard Deviation	0.64924079		
Akaike's 'A' Information Criterion	83.5150531		
Schwarz's Bayesian Criterion	88.5816915		
RSquare	0.75596061		
RSquare Adj	0.74276929		
MAPE	7.6061656		
MAE	0.51864368		
-2LogLikelihood	77.5150531		

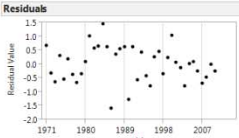
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.224879	0.1332238	9.19	<.0001*	1.83086485
AR2	2	-0.496391	0.1336066	-3.72	0.0007*	
Intercept	0	6.743228	0.3563441	18.92	<.0001*	

Forecast

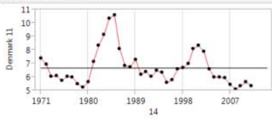


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0156	0.0105	0.9185	1	0.0156
2	-0.0874	0.3482	0.8402	2	-0.0877
3	-0.0232	0.3727	0.9458	3	-0.0205
4	0.1988	2.2173	0.6959	4	0.1935
5	-0.1202	2.9110	0.7137	5	-0.1369
6	-0.1698	4.3351	0.6314	6	-0.1400
7	-0.1452	5.4082	0.6103	7	-0.1564
8	0.0495	5.5370	0.6989	8	-0.0118
9	0.0132	5.5464	0.7843	9	0.0380
10	-0.2417	8.8186	0.5494	10	-0.2271
11	-0.0871	9.2585	0.5980	11	-0.0744
12	0.0768	9.6122	0.6499	12	-0.0232
13	0.1911	11.8838	0.5372	13	0.1437
14	-0.1662	13.6679	0.4747	14	-0.1216
15	0.0209	13.6973	0.5486	15	0.0111
16	0.0899	14.2630	0.5791	16	-0.0079
17	0.2642	19.3616	0.3082	17	0.1674
18	0.0123	19.3732	0.3692	18	0.1189
19	-0.1207	20.5390	0.3628	19	-0.1184
20	0.0337	20.6347	0.4189	20	0.0105
21	-0.0469	20.8292	0.4694	21	-0.2154
22	-0.0658	21.2338	0.5063	22	0.0282
23	-0.1089	22.4055	0.4959	23	0.0657
24	-0.0863	23.1882	0.5087	24	-0.1417
25	-0.0482	23.4480	0.5514	25	-0.0596

Time Series Denmark 11



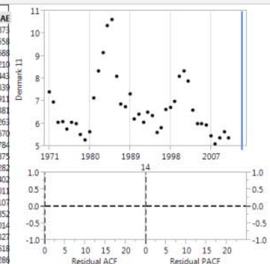
Mean	6.6866805
Std	1.2801305
N	41
Zero Mean ADF	-0.745361
Single Mean ADF	-1.787298
Trend ADF	-1.840922

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8126	29.1011	<.0001*	1	0.8126
2	0.5101	40.8613	<.0001*	2	-0.4421
3	0.2328	43.3754	<.0001*	3	-0.0206
4	-0.0016	43.3755	<.0001*	4	-0.1549
5	-0.2147	45.6331	<.0001*	5	-0.2098
6	-0.3420	51.5235	<.0001*	6	0.0438
7	-0.3750	58.8136	<.0001*	7	-0.0478
8	-0.3554	65.5605	<.0001*	8	-0.0801
9	-0.3439	72.0763	<.0001*	9	-0.1792
10	-0.3074	77.4500	<.0001*	10	-0.0098
11	-0.1938	79.6570	<.0001*	11	0.1328
12	-0.0373	79.7415	<.0001*	12	0.0432
13	0.0806	80.1503	<.0001*	13	-0.0624
14	0.1487	81.5948	<.0001*	14	-0.0360
15	0.2417	85.5554	<.0001*	15	0.2100
16	0.3136	92.4889	<.0001*	16	-0.0032
17	0.3094	99.5227	<.0001*	17	-0.0046
18	0.2062	102.783	<.0001*	18	-0.1697
19	0.0639	103.111	<.0001*	19	-0.1068
20	-0.0659	103.475	<.0001*	20	0.0366
21	-0.1754	106.188	<.0001*	21	0.0051
22	-0.2721	113.060	<.0001*	22	-0.0653
23	-0.3100	122.473	<.0001*	23	-0.0590
24	-0.3152	132.777	<.0001*	24	-0.1962
25	-0.2891	141.988	<.0001*	25	0.0612

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	38	0.4230195	85.636703	90.777419	0.754	79.636703	0.214944	7.713298	0.52287
☐	☐	ARIMA(2, 1, 1	36	0.435609	86.703845	93.459363	0.749	78.703845	0.126066	7.705190	0.52355
☐	☐	ARMA(1, 2)	37	0.424011	86.833619	93.687907	0.759	78.833619	0.118146	7.487878	0.50868
☐	☐	ARMA(2, 1)	37	0.4337044	87.574937	94.429226	0.755	79.574937	0.081554	7.684756	0.52121
☐	☐	ARMA(2, 2)	36	0.4223957	87.762780	96.330641	0.765	77.76278	0.074243	7.131058	0.48344
☐	☐	ARMA(1, 1)	38	0.4473013	87.782519	92.923235	0.740	81.782519	0.073514	7.590773	0.52033
☐	☐	IMA(1, 1)	38	0.5041512	88.237960	91.615719	0.712	84.23796	0.058542	7.711367	0.52291
☐	☐	MA(2)	38	0.4470685	88.285632	93.426348	0.739	82.285632	0.057163	7.973877	0.54238
☐	☐	ARI(2, 1)	37	0.5044024	89.264137	94.330776	0.719	83.264137	0.035046	7.565562	0.51326
☐	☐	ARI(1, 1)	38	0.5184531	89.326673	92.704432	0.704	85.326673	0.033967	7.837018	0.53067
☐	☐	ARIMA(1, 1, 2	36	0.4921642	89.529117	96.284635	0.732	81.529117	0.030697	7.506338	0.50578
☐	☐	IMA(1, 2)	37	0.5125662	89.888227	94.954866	0.715	83.888227	0.025652	7.709849	0.52187
☐	☐	ARIMA(1, 1, 1	37	0.5155893	90.086968	95.153607	0.713	84.086968	0.023225	7.723361	0.52328
☐	☐	ARIMA(2, 1, 2	35	0.5001079	91.055881	99.500278	0.735	81.055881	0.014308	7.544290	0.51040
☐	☐	IMA(2, 2)	36	0.5315603	92.111780	97.102465	0.689	86.11178	0.008439	7.990138	0.54201
☐	☐	ARIMA(1, 2, 1	36	0.5473929	92.942057	97.932742	0.683	86.942057	0.005572	8.120380	0.54910
☐	☐	I(1)	39	0.5843189	93.010035	94.698914	0.658	91.010035	0.005386	8.119424	0.56185
☐	☐	ARIMA(2, 2, 1	35	0.5327224	93.250404	99.904650	0.696	85.250404	0.004776	7.899223	0.53501
☐	☐	ARIMA(1, 2, 2	35	0.544805	93.829336	100.48358	0.691	85.829336	0.003575	8.030469	0.54332
☐	☐	AR(1)	39	0.5456393	94.586636	98.013780	0.677	90.586636	0.002448	8.026391	0.56161
☐	☐	ARIMA(2, 2, 2	34	0.5474487	95.232334	103.55014	0.696	85.232334	0.001773	7.878259	0.53328
☐	☐	IMA(2, 1)	37	0.6150976	97.359978	100.68710	0.629	93.359978	0.000612	8.478232	0.58217
☐	☐	ARI(2, 2)	36	0.7036486	100.05541	105.04610	0.618	94.055412	0.000159	9.354529	0.62766
☐	☐	I(2)	38	0.7543947	100.67242	102.33598	0.569	98.672417	0.000117	10.607702	0.70806
☐	☐	ARI(1, 2)	37	0.7534535	101.61069	104.93782	0.581	97.610694	0.000073	10.111924	0.67684
☐	☐	MA(1)	39	0.7403876	106.87044	110.29758	0.566	102.87044	0.000005	10.144168	0.69395
☐	☐	ARIMA(0, 0, 0	40	1.6797025	138.60385	140.31742	0.000	136.60385	0.000000	14.104178	0.97383



Model: AR(2)

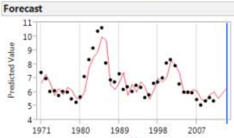
Model Summary

DF	38	Stable	Yes
Sum of Squared Errors	16.0747419	Invertible	Yes
Variance Estimate	0.42301952		
Standard Deviation	0.65039951		
Akaike's 'A' Information Criterion	85.6367027		
Schwarz's Bayesian Criterion	90.7774189		
RSquare	0.75447387		
RSquare Adj	0.74155145		
MAPE	7.71329764		
MAE	0.52287269		
-2LogLikelihood	79.6367027		

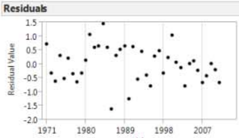
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.223330	0.1337061	9.15	<.0001*	1.72030034
AR2	2	-0.480864	0.1334284	-3.60	0.0009*	
Intercept	0	6.679915	0.3708602	18.01	<.0001*	

Forecast

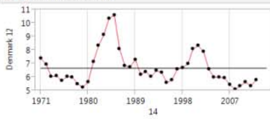


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0241	0.0255	0.8730	1	0.0241
2	-0.0982	0.4611	0.7941	2	-0.0988
3	-0.0127	0.4685	0.9257	3	-0.0078
4	0.2123	2.6169	0.6238	4	0.2053
5	-0.1057	3.1636	0.6748	5	-0.1252
6	-0.1682	4.5882	0.5976	6	-0.1312
7	-0.1362	5.5496	0.5932	7	-0.1483
8	0.0905	5.9867	0.6487	8	0.0331
9	0.0287	6.0321	0.7367	9	0.0544
10	-0.2261	8.9401	0.5378	10	-0.1958
11	-0.1234	9.8345	0.5453	11	-0.1001
12	0.0678	10.1138	0.6060	12	-0.0337
13	0.2015	12.6712	0.4735	13	0.1733
14	-0.1810	14.8108	0.3912	14	-0.1259
15	-0.0028	14.8113	0.4651	15	0.0323
16	0.1212	15.8466	0.4637	16	0.0285
17	0.2764	21.4585	0.2064	17	0.1735
18	-0.0031	21.4593	0.2569	18	0.1112
19	-0.0993	22.2501	0.2720	19	-0.0848
20	0.0075	22.2548	0.3268	20	-0.0340
21	0.0067	22.2587	0.3847	21	-0.1700
22	-0.0854	22.9360	0.4054	22	0.0003
23	-0.1259	24.4886	0.3772	23	0.0460
24	-0.0969	25.4622	0.3810	24	-0.1174
25	0.0263	25.5384	0.4325	25	-0.0226

Time Series Denmark 12



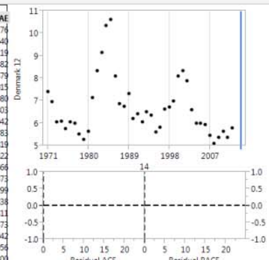
Mean	6.6653833
Std	1.2721293
N	42
Zero Mean ADF	-0.67363
Single Mean ADF	-1.891491
Trend ADF	-1.926921

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8205	30.3472	<.0001*	1	0.8205
2	0.5182	42.7552	<.0001*	2	-0.4746
3	0.2482	45.6749	<.0001*	3	0.0419
4	0.0207	45.6957	<.0001*	4	-0.1851
5	-0.1938	47.5724	<.0001*	5	-0.2159
6	-0.3256	53.0160	<.0001*	6	0.0827
7	-0.3585	59.8027	<.0001*	7	-0.0544
8	-0.3385	66.0305	<.0001*	8	-0.0724
9	-0.3342	72.2868	<.0001*	9	-0.1945
10	-0.3150	78.0178	<.0001*	10	-0.0158
11	-0.2091	80.6249	<.0001*	11	0.1826
12	-0.0523	80.7935	<.0001*	12	0.0178
13	0.0775	81.1762	<.0001*	13	-0.0010
14	0.1474	82.6102	<.0001*	14	-0.0955
15	0.2393	86.5288	<.0001*	15	0.2416
16	0.3205	93.8320	<.0001*	16	-0.0006
17	0.3193	101.370	<.0001*	17	-0.0388
18	0.2077	104.691	<.0001*	18	-0.1662
19	0.0652	105.033	<.0001*	19	-0.0927
20	-0.0570	105.306	<.0001*	20	0.0450
21	-0.1698	107.844	<.0001*	21	-0.0424
22	-0.2623	114.203	<.0001*	22	0.0456
23	-0.3144	123.819	<.0001*	23	-0.1983
24	-0.3121	133.816	<.0001*	24	-0.0647
25	-0.2874	142.792	<.0001*	25	-0.0068

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	39	0.4135837	86.656049	91.869058	0.757	80.656049	0.241224	7.616438	0.515176
☐	☐	ARIMA(2, 1, 1	37	0.4276962	88.011990	94.866278	0.750	80.01199	0.122456	7.695241	0.520640
☐	☐	ARMA(1, 2)	38	0.4165979	88.036267	94.986945	0.761	80.036267	0.120979	7.464414	0.505119
☐	☐	ARMA(2, 1)	38	0.4241431	88.627366	95.578045	0.757	80.627366	0.090023	7.604913	0.514482
☐	☐	ARMA(1, 1)	39	0.4385171	88.956756	94.169765	0.742	82.956756	0.076353	7.543563	0.515479
☐	☐	ARMA(2, 2)	37	0.4158102	89.030512	97.718860	0.766	79.030512	0.073589	7.138876	0.482015
☐	☐	MA(2)	39	0.4378248	89.400815	94.613824	0.741	83.400815	0.061151	7.904166	0.536080
☐	☐	ARIMA(1, 1, 2	37	0.4558919	89.969595	96.823883	0.737	81.969595	0.046014	7.534277	0.514403
☐	☐	IMA(1, 1)	39	0.5004794	90.087263	93.514407	0.710	86.087263	0.043385	7.800820	0.526042
☐	☐	ARI(1, 1)	39	0.513488	91.109780	94.536924	0.703	87.10978	0.026020	7.908587	0.532783
☐	☐	ARI(2, 1)	38	0.502403	91.242347	96.383064	0.716	85.242347	0.024351	7.694790	0.518819
☐	☐	IMA(1, 2)	38	0.5095425	91.801589	96.942305	0.712	85.801589	0.018411	7.804480	0.525522
☐	☐	ARIMA(1, 1, 1	38	0.5118123	91.956262	97.096978	0.711	85.956262	0.017041	7.816466	0.526666
☐	☐	ARIMA(2, 1, 2	36	0.5000241	93.166370	101.73423	0.731	83.16637	0.009305	7.501631	0.503373
☐	☐	ARIMA(2, 2, 2	35	0.455621	93.932973	102.37737	0.713	83.932973	0.006342	7.877286	0.525299
☐	☐	IMA(2, 2)	37	0.5274866	94.040037	99.106676	0.687	88.040037	0.006012	8.092521	0.545838
☐	☐	I(1)	40	0.5755666	94.692149	96.405721	0.658	92.692149	0.004339	8.125441	0.559311
☐	☐	ARIMA(1, 2, 1	37	0.5414532	94.778172	99.844810	0.681	88.778172	0.004156	8.197015	0.551473
☐	☐	ARIMA(2, 2, 1	36	0.5309604	95.323901	102.07942	0.692	87.323901	0.003164	8.038069	0.541042
☐	☐	ARIMA(1, 2, 2	36	0.5404377	95.774709	102.53023	0.689	87.774709	0.002525	8.128432	0.546956
☐	☐	AR(1)	40	0.5332725	95.840523	99.315862	0.681	91.840523	0.002444	7.926826	0.553300
☐	☐	IMA(2, 1)	38	0.6058243	99.130253	102.50801	0.630	95.130253	0.000472	8.455761	0.577619
☐	☐	ARI(2, 2)	37	0.6934513	101.96678	107.03342	0.617	95.96678	0.000114	9.305218	0.622638
☐	☐	I(2)	39	0.7475516	102.86429	104.55317	0.567	100.86429	0.000073	10.643603	0.708040
☐	☐	ARI(1, 2)	38	0.7431012	103.61756	106.99532	0.580	99.61756	0.000050	10.059366	0.671554
☐	☐	MA(1)	40	0.7226422	108.39585	111.87119	0.571	104.39585	0.000005	9.957895	0.680977
☐	☐	ARIMA(0, 0, 0	41	1.6577841	141.40898	143.14665	0.000	139.40898	0.000000	14.015194	0.966875



Model: AR(2)

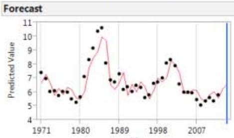
Model Summary

DF	39	Stable	Yes
Sum of Squared Errors	16.1297634	Invertible	Yes
Variance Estimate	0.41358368		
Standard Deviation	0.64310472		
Akaike's 'A' Information Criterion	86.6560492		
Schwarz's Bayesian Criterion	91.8690581		
RSquare	0.75682072		
RSquare Adj	0.74434999		
MAPE	7.61643849		
MAE	0.51517564		
-2LogLikelihood	80.6560492		

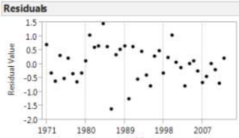
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.219448	0.1318183	9.25	<.0001*	1.75334799
AR2	2	-0.481156	0.1321628	-3.64	0.0008*	
Intercept	0	6.699629	0.3573538	18.75	<.0001*	

Forecast



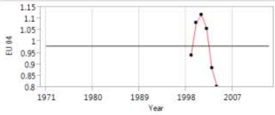
Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0192	0.0166	0.8975	1	0.0192
2	-0.0952	0.4350	0.8045	2	-0.0956
3	-0.0096	0.4394	0.9320	3	-0.0058
4	0.2068	2.5188	0.6413	4	0.1999
5	-0.1152	3.1818	0.6720	5	-0.1317
6	-0.1720	4.7013	0.5827	6	-0.1379
7	-0.1366	5.6862	0.5768	7	-0.1526
8	0.0864	6.0915	0.6370	8	0.0295
9	0.0139	6.1023	0.7296	9	0.0423
10	-0.2307	9.1748	0.5156	10	-0.2011
11	-0.1242	10.0942	0.5219	11	-0.1127
12	0.0801	10.4891	0.5731	12	-0.0259
13	0.2029	13.1130	0.4391	13	0.1790
14	-0.1833	15.3293	0.3560	14	-0.1292
15	0.0077	15.3334	0.4277	15	0.0305
16	0.1256	16.4544	0.4217	16	0.0173
17	0.2649	21.6401	0.1990	17	0.1665
18	-0.0084	21.6455	0.2481	18	0.1148
19	-0.0905	22.3029	0.2694	19	-0.0796
20	-0.0008	22.3030	0.3243	20	-0.0538
21	0.0149	22.3224	0.3811	21	-0.1539
22	-0.1042	23.3255	0.3835	22	-0.0125
23	-0.1183	24.6870	0.3666	23	0.0602
24	-0.0907	25.5314	0.3774	24	-0.1092
25	0.0280	25.6164	0.4283	25	-0.0391

European Union

Time Series EU 04



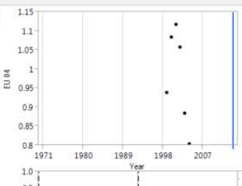
Mean	0.9806693
Std	0.1136608
N	6
Zero Mean ADF	-0.540679
Single Mean ADF	-0.428734
Trend ADF	-2.21456

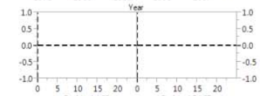
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3856	1.4277	0.2321	1	0.3856
2	-0.3189	2.6482	0.2660	2	-0.5493
3	-0.4814	6.3562	0.0955	3	-0.1329
4	-0.1810	7.1422	0.1286	4	-0.0464
5	0.0957	7.5815	0.1809	5	-0.1098
6	0.0000	.	.	6	-0.3002
7	0.0000	.	.	7	0.1370
8	0.0000	.	.	8	-0.2279
9	0.0000	.	.	9	-0.0753
10	0.0000	.	.	10	-0.0487
11	0.0000	.	.	11	-0.0323
12	0.0000	.	.	12	-0.1843
13	0.0000	.	.	13	0.0642
14	0.0000	.	.	14	-0.1258
15	0.0000	.	.	15	-0.0482
16	0.0000	.	.	16	-0.0553
17	0.0000	.	.	17	-0.0056
18	0.0000	.	.	18	-0.1275
19	0.0000	.	.	19	0.0289
20	0.0000	.	.	20	-0.0820
21	0.0000	.	.	21	-0.0298
22	0.0000	.	.	22	-0.0569
23	0.0000	.	.	23	0.0027
24	0.0000	.	.	24	-0.0926
25	0.0000	.	.	25	0.0113

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARMA(2, 2)	1	0.0005131	-16.23325	-17.27446	0.752	-26.23325	0.414283	3.296629	0.034455
☐	☐	ARMA(2, 1)	2	0.0006958	-15.87125	-16.70421	0.749	-23.87125	0.345692	3.608240	0.037251
☐	☐	AR(2)	3	0.0015505	-14.60351	-15.22823	0.729	-20.60351	0.183401	4.210007	0.042591
☐	☐	MA(1)	4	0.0078526	-8.541060	-8.957541	0.460	-12.54106	0.008850	7.632362	0.074294
☐	☐	MA(2)	3	0.0061058	-8.313375	-8.938097	0.594	-14.31338	0.007898	5.420814	0.052925
☐	☐	ARIMA(0, 0, 0	5	0.0155025	-7.067182	-7.275422	0.000	-9.067182	0.004236	11.071756	0.105334
☐	☐	ARMA(1, 1)	3	0.0086957	-7.040883	-7.665605	0.516	-13.04088	0.004180	6.069259	0.059812
☐	☐	ARMA(1, 2)	2	0.0076179	-6.753008	-7.585970	0.618	-14.75301	0.003620	4.633273	0.045601
☐	☐	AR(1)	4	0.0140926	-6.615735	-7.032216	0.272	-10.61573	0.003380	8.616595	0.082453
☐	☐	ARIMA(2, 1, 1	1	0.0051939	-6.297163	-7.859411	0.626	-14.29716	0.002882	5.769810	0.058984
☐	☐	I(2)	3	0.010232	-6.128161	-6.741867	0.523	-8.128161	0.002649	8.475424	0.075533
☐	☐	I(1)	4	0.0146586	-6.039964	-6.430526	0.222	-8.039964	0.002534	9.509039	0.092901
☐	☐	ARI(2, 1)	2	0.008066	-6.037628	-7.209314	0.568	-12.03763	0.002531	6.812779	0.067336
☐	☐	ARIMA(2, 1, 2	0	.	-5.966074	-7.918885	0.633	-15.96607	0.002442	5.255754	0.054865
☐	☐	IMA(1, 1)	3	0.0131553	-5.517006	-6.298130	0.383	-9.517006	0.001951	7.711803	0.075706
☐	☐	ARI(1, 1)	3	0.0143154	-5.228079	-6.009203	0.336	-9.228079	0.001689	8.637441	0.085762
☐	☐	IMA(2, 1)	2	0.0078046	-5.224062	-6.451474	0.672	-9.224062	0.001685	7.601945	0.069140
☐	☐	IMA(1, 2)	2	0.0088222	-5.197234	-6.368921	0.494	-11.19723	0.001663	7.835487	0.078097
☐	☐	ARI(1, 2)	2	0.0134433	-4.430037	-5.657448	0.575	-8.430037	0.001133	8.236459	0.073785
☐	☐	ARIMA(1, 1, 1	2	0.0181237	-3.804436	-4.976123	0.401	-9.804436	0.000829	8.589312	0.084350
☐	☐	IMA(2, 2)	1	0.0079988	-3.578935	-5.420051	0.737	-9.578935	0.000740	6.765405	0.062282
☐	☐	ARI(2, 2)	1	0.0251291	-2.545440	-4.386557	0.599	-8.54544	0.000442	8.137753	0.072971
☐	☐	ARIMA(1, 2, 1	1	0.030696	-2.128161	-3.969278	0.523	-8.128161	0.000358	8.475424	0.075533
☐	☐	ARIMA(1, 1, 2	1	0.0306359	-2.033490	-3.595739	0.443	-10.03349	0.000342	6.100087	0.059717
☐	☐	ARIMA(1, 2, 2	0	.	-1.426209	-3.881031	0.697	-9.426209	0.000252	7.364682	0.067585
☐	☐	ARIMA(2, 2, 1	0	.	-1.365882	-3.820705	0.707	-9.365882	0.000245	7.175638	0.065615
☐	☐	ARIMA(2, 2, 2	-1	-0.012274	0.571064	-2.497464	0.700	-9.428936	0.000093	7.323949	0.067214





Model: ARMA(2, 2)

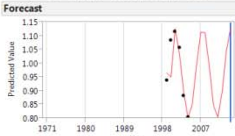
Model Summary

DF	1	Stable	Yes
Sum of Squared Errors	0.00051308	Invertible	Yes
Variance Estimate	0.00051308		
Standard Deviation	0.02265127		
Akaike's 'A' Information Criterion	-16.233255		
Schwarz's Bayesian Criterion	-17.274458		
RSquare	0.75211845		
RSquare Adj	-0.2394077		
MAPE	3.29662915		
MAE	0.03445522		
-2LogLikelihood	-26.233255		

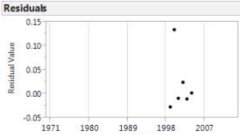
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.170410	0.0786188	14.89	0.0427*	0.80060181
AR2	2	-0.999040	0.0021991	-4543	0.0014*	
MA1	1	1.617674	0.8091578	2.00	0.2953	
MA2	2	-0.999982	0.7970806	-1.25	0.4284	
Intercept	0	0.966175	0.0085820	112.58	0.0057*	

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	-0.4793	2.2056	0.1375	1	-0.4793
2	0.1536	2.4886	0.2881	2	-0.0989
3	-0.1847	3.0343	0.3864	3	-0.1982
4	-0.0343	3.0625	0.5474	4	-0.2716
5	0.0447	3.1586	0.6756	5	-0.1481
6	0.0000	.	.	6	-0.1035
7	0.0000	.	.	7	-0.1343
8	0.0000	.	.	8	-0.1198
9	0.0000	.	.	9	-0.0890
10	0.0000	.	.	10	-0.0864
11	0.0000	.	.	11	-0.0864
12	0.0000	.	.	12	-0.0756
13	0.0000	.	.	13	-0.0683
14	0.0000	.	.	14	-0.0663
15	0.0000	.	.	15	-0.0624
16	0.0000	.	.	16	-0.0576
17	0.0000	.	.	17	-0.0547
18	0.0000	.	.	18	-0.0523
19	0.0000	.	.	19	-0.0495
20	0.0000	.	.	20	-0.0470
21	0.0000	.	.	21	-0.0450
22	0.0000	.	.	22	-0.0431
23	0.0000	.	.	23	-0.0413
24	0.0000	.	.	24	-0.0396
25	0.0000	.	.	25	-0.0382

Time Series EU 05

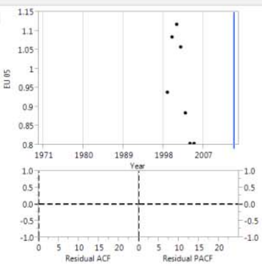
Mean	0.9553276
Std	0.1221738
N	7
Zero Mean ADF	-0.570143
Single Mean ADF	-0.495103
Trend ADF	-2.870097

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.5901	3.6561	0.0559	1	0.5901
2	-0.0554	3.6948	0.1576	2	-0.6193
3	-0.4877	7.4417	0.0591	3	-0.1726
4	-0.4091	10.9565	0.0271*	4	0.2090
5	-0.1620	11.7831	0.0379*	5	-0.3166
6	0.0242	11.8199	0.0661	6	-0.0787
7	0.0000	.	.	7	-0.1304
8	0.0000	.	.	8	0.0972
9	0.0000	.	.	9	-0.1999
10	0.0000	.	.	10	-0.1741
11	0.0000	.	.	11	0.1776
12	0.0000	.	.	12	-0.2092
13	0.0000	.	.	13	-0.0714
14	0.0000	.	.	14	-0.0114
15	0.0000	.	.	15	-0.0198
16	0.0000	.	.	16	-0.0688
17	0.0000	.	.	17	-0.1478
18	0.0000	.	.	18	0.1218
19	0.0000	.	.	19	-0.1164
20	0.0000	.	.	20	-0.1037
21	0.0000	.	.	21	0.0493
22	0.0000	.	.	22	-0.0584
23	0.0000	.	.	23	-0.0349
24	0.0000	.	.	24	-0.0989
25	0.0000	.	.	25	0.0589

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARMA(2, 2)	2	0.0003286	-21.80720	-22.07765	0.805	-31.8072	0.636701	3.025195	0.031027
☐	☐	ARMA(2, 1)	3	0.0006719	-20.06472	-20.28108	0.794	-28.06472	0.266416	3.479750	0.034839
☐	☐	AR(2)	4	0.0017946	-17.52075	-17.68302	0.762	-23.52075	0.074670	4.308280	0.041768
☐	☐	MA(2)	4	0.0046695	-11.99506	-12.15733	0.693	-17.99506	0.004713	5.079802	0.049178
☐	☐	ARMA(1, 2)	3	0.0049996	-10.74107	-10.95743	0.715	-18.74107	0.002517	3.943078	0.038821
☐	☐	MA(1)	5	0.0079583	-10.24551	-10.35369	0.499	-14.24551	0.001965	7.932772	0.075878
☐	☐	ARIMA(2, 1, 2	1	0.002734	-10.16781	-11.20901	0.731	-20.16781	0.001890	5.175186	0.052055
☐	☐	ARMA(1, 1)	4	0.0085045	-9.851154	-10.01342	0.614	-15.85115	0.001613	5.930694	0.057144
☐	☐	ARIMA(2, 1, 1	2	0.0038125	-9.756562	-10.58952	0.700	-17.75656	0.001539	5.895958	0.057934
☐	☐	AR(1)	5	0.0114757	-9.202728	-9.310907	0.450	-13.20273	0.001167	7.895384	0.074643
☐	☐	ARI(2, 1)	3	0.0072089	-9.051163	-9.675884	0.638	-15.05116	0.001081	6.787016	0.065122
☐	☐	IMA(1, 2)	3	0.0060026	-8.687410	-9.312131	0.640	-14.68741	0.000902	6.980010	0.068537
☐	☐	I(1)	5	0.0118416	-8.683490	-8.891731	0.432	-10.68349	0.000900	8.487281	0.081789
☐	☐	IMA(1, 1)	4	0.0098021	-8.611929	-9.028410	0.552	-12.61193	0.000868	6.593701	0.064425
☐	☐	ARI(1, 1)	4	0.0112758	-7.984486	-8.400967	0.513	-11.98449	0.000634	7.875568	0.076769
☐	☐	ARIMA(0, 0, 0	6	0.0174142	-7.567208	-7.621297	0.000	-9.567208	0.000515	11.948946	0.112008
☐	☐	I(2)	4	0.0112958	-7.342967	-7.733529	0.471	-9.342967	0.000460	10.391368	0.092723
☐	☐	ARIMA(1, 1, 1	3	0.011897	-6.988113	-7.612835	0.569	-12.98811	0.000385	7.342841	0.071776
☐	☐	IMA(2, 1)	3	0.0125639	-6.077511	-6.858635	0.548	-10.07751	0.000244	8.719835	0.077497
☐	☐	ARI(1, 2)	3	0.0129618	-5.942547	-6.723671	0.533	-9.942547	0.000229	8.947066	0.079468
☐	☐	ARIMA(1, 1, 2	2	0.0159758	-5.188545	-6.021508	0.591	-13.18855	0.000157	5.476918	0.053199
☐	☐	IMA(2, 2)	2	0.0107024	-4.593806	-5.765492	0.604	-10.59381	0.000116	8.581422	0.077548
☐	☐	ARI(2, 2)	2	0.0166867	-4.443536	-5.615222	0.592	-10.44354	0.000108	8.333829	0.074697
☐	☐	ARIMA(1, 2, 1	2	0.0188052	-4.083745	-5.255431	0.548	-10.08374	0.000090	8.664346	0.077011
☐	☐	ARIMA(2, 2, 2	0	.	-3.007947	-4.960758	0.715	-13.00795	0.000053	6.313295	0.059590
☐	☐	ARIMA(1, 2, 2	1	0.0217828	-2.612856	-4.175105	0.589	-10.61286	0.000043	8.217864	0.074266
☐	☐	ARIMA(2, 2, 1	1	0.0452555	-1.334963	-2.897212	0.470	-9.334963	0.000023	6.466281	0.053214



Model: ARMA(2, 2)

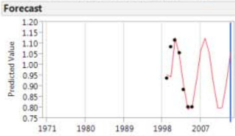
Model Summary

DF	2	Stable	Yes
Sum of Squared Errors	0.00065729	Invertible	Yes
Variance Estimate	0.00032865		
Standard Deviation	0.0181286		
Akaike's 'A' Information Criterion	-21.807203		
Schwarz's Bayesian Criterion	-22.077652		
RSquare	0.8047831		
RSquare Adj	0.41434931		
MAPE	3.02519475		
MAE	0.03102709		
-2LogLikelihood	-31.807203		

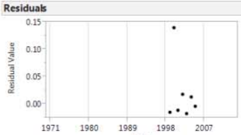
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.263655	0.0354913	35.60	0.0008*	0.70177324
AR2	2	-0.999153	0.0017395	-574.4	<.0001*	
MA1	1	1.663834	0.6400905	2.60	0.1216	
MA2	2	-0.999967	0.6173979	-1.62	0.2467	
Intercept	0	0.954148	0.0033621	283.80	<.0001*	

Forecast

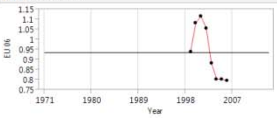


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	-0.3899	1.5961	0.2065	1	-0.3899
2	0.1455	1.8629	0.3940	2	-0.0076
3	-0.2254	2.6628	0.4466	3	-0.2018
4	0.0633	2.7470	0.6010	4	-0.1126
5	-0.1306	3.2847	0.6562	5	-0.1670
6	0.0370	3.3710	0.7610	6	-0.1395
7	0.0000	.	.	7	-0.0680
8	0.0000	.	.	8	-0.0993
9	0.0000	.	.	9	-0.0886
10	0.0000	.	.	10	-0.0775
11	0.0000	.	.	11	-0.0764
12	0.0000	.	.	12	-0.0641
13	0.0000	.	.	13	-0.0639
14	0.0000	.	.	14	-0.0612
15	0.0000	.	.	15	-0.0557
16	0.0000	.	.	16	-0.0537
17	0.0000	.	.	17	-0.0505
18	0.0000	.	.	18	-0.0482
19	0.0000	.	.	19	-0.0463
20	0.0000	.	.	20	-0.0439
21	0.0000	.	.	21	-0.0422
22	0.0000	.	.	22	-0.0405
23	0.0000	.	.	23	-0.0389
24	0.0000	.	.	24	-0.0375
25	0.0000	.	.	25	-0.0361

Time Series EU 06



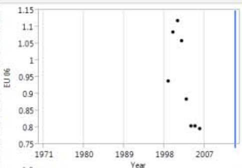
Mean	0.9354102
Std	0.1258474
N	8
Zero Mean ADF	-0.61517
Single Mean ADF	-0.54333
Trend ADF	-2.891301

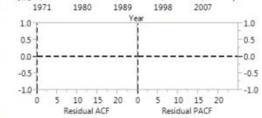
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.6773	5.2430	0.0220*	1	0.6773
2	0.1448	5.5225	0.0632	2	-0.5801
3	-0.3163	7.1229	0.0681	3	-0.2180
4	-0.4787	11.7063	0.0197*	4	0.0516
5	-0.3574	15.1131	0.0099*	5	-0.0018
6	-0.1661	16.2160	0.0126*	6	-0.2152
7	-0.0036	16.2170	0.0232*	7	-0.0108
8	0.0000	.	.	8	-0.2303
9	0.0000	.	.	9	0.1337
10	0.0000	.	.	10	-0.1138
11	0.0000	.	.	11	-0.1327
12	0.0000	.	.	12	-0.0598
13	0.0000	.	.	13	0.0485
14	0.0000	.	.	14	-0.1395
15	0.0000	.	.	15	0.0100
16	0.0000	.	.	16	-0.1185
17	0.0000	.	.	17	0.0114
18	0.0000	.	.	18	-0.0442
19	0.0000	.	.	19	-0.0408
20	0.0000	.	.	20	-0.0902
21	0.0000	.	.	21	0.0343
22	0.0000	.	.	22	-0.0836
23	0.0000	.	.	23	-0.0033
24	0.0000	.	.	24	-0.0669
25	0.0000	.	.	25	-0.0077

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARMA(2, 1)	4	0.0018822	-18.25480	-17.93704	0.777	-26.2548	0.319396	4.371297	0.040943
☐	☐	AR(2)	5	0.0032133	-17.62335	-17.38502	0.735	-23.62335	0.232922	5.017502	0.046735
☐	☐	ARMA(2, 2)	3	0.0010625	-17.53154	-17.13434	0.795	-27.53154	0.222472	3.708821	0.035231
☐	☐	MA(2)	5	0.004747	-14.09085	-13.85253	0.692	-20.09085	0.039823	5.823187	0.055120
☐	☐	ARMA(1, 1)	5	0.0064887	-13.29606	-13.05774	0.670	-19.29606	0.026764	5.416053	0.052025
☐	☐	ARMA(1, 2)	4	0.0045716	-13.20248	-12.88471	0.717	-21.20248	0.025541	4.813861	0.045644
☐	☐	MA(1)	6	0.0071171	-12.96332	-12.80443	0.555	-16.96332	0.022662	7.881750	0.074680
☐	☐	ARI(2, 1)	4	0.0061091	-12.25179	-12.41406	0.672	-18.25179	0.015878	6.390433	0.060658
☐	☐	AR(1)	6	0.0097056	-11.98479	-11.82591	0.537	-15.98479	0.013894	7.418909	0.069519
☐	☐	IMA(1, 1)	5	0.0078004	-11.88059	-11.98877	0.631	-15.88059	0.013188	5.829727	0.056673
☐	☐	I(1)	6	0.0099014	-11.51950	-11.57359	0.531	-13.5195	0.011010	7.517942	0.071976
☐	☐	IMA(1, 2)	4	0.0052272	-11.45534	-11.61761	0.651	-17.45534	0.010662	7.189713	0.068501
☐	☐	ARI(1, 1)	5	0.0090104	-11.10725	-11.21543	0.597	-15.10725	0.008959	6.969429	0.067613
☐	☐	ARIMA(1, 1, 1	4	0.0088806	-10.33246	-10.49473	0.641	-16.33246	0.006082	6.488367	0.063047
☐	☐	I(2)	5	0.0091207	-10.24992	-10.45816	0.549	-12.24992	0.005836	9.081576	0.081013
☐	☐	ARIMA(2, 1, 2	2	0.003718	-9.986161	-10.25661	0.707	-19.98616	0.005115	5.461749	0.051973
☐	☐	IMA(2, 1)	4	0.0094139	-9.218272	-9.634753	0.618	-13.21827	0.003484	7.344184	0.065262
☐	☐	ARI(1, 2)	4	0.0098312	-9.011005	-9.427486	0.603	-13.01101	0.003141	7.801340	0.068788
☐	☐	ARIMA(0, 0, 0	7	0.0181001	-8.459950	-8.380508	0.000	-10.45995	0.002385	12.253873	0.113768
☐	☐	ARIMA(1, 1, 2	3	0.0088537	-8.389322	-8.605682	0.645	-16.38932	0.002302	5.673296	0.053344
☐	☐	ARI(2, 2)	3	0.0114831	-7.594799	-8.219520	0.644	-13.5948	0.001547	7.169945	0.064155
☐	☐	ARIMA(2, 2, 2	1	0.0061736	-7.491083	-8.532285	0.756	-17.49108	0.001469	5.347301	0.050346
☐	☐	ARIMA(2, 2, 1	2	0.0079731	-7.479003	-8.311965	0.727	-15.479	0.001460	6.013484	0.055565
☐	☐	IMA(2, 2)	3	0.0124409	-7.249630	-7.874352	0.620	-13.24963	0.001302	7.271993	0.064310
☐	☐	ARIMA(2, 1, 1	3	0.016149	-6.947242	-7.163602	0.618	-14.94724	0.001119	7.763556	0.072593
☐	☐	ARIMA(1, 2, 1	3	0.0130287	-6.585638	-7.210360	0.572	-12.58564	0.000934	8.950652	0.080727
☐	☐	ARIMA(1, 2, 2	2	0.0147846	-5.876922	-6.709884	0.655	-13.87692	0.000655	7.618256	0.068682





Model: ARMA(2, 1)

Model Summary

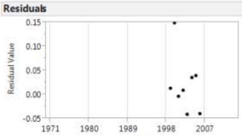
DF	4	Stable	Yes
Sum of Squared Errors	0.0075288	Invertible	Yes
Variance Estimate	0.0018822		
Standard Deviation	0.04338433		
Akaike's 'A' Information Criterion	-18.254803		
Schwarz's Bayesian Criterion	-17.937036		
RSquare	0.77711843		
RSquare Adj	0.60995725		
MAPE	4.37129721		
MAE	0.04094265		
-2LogLikelihood	-26.254803		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.430542	0.0844256	16.94	<.0001*	0.49443491
AR2	2	-0.964474	0.0394163	-24.47	<.0001*	
MA1	1	0.999992	0.4433907	2.26	0.0871	
Intercept	0	0.926025	0.0117194	79.02	<.0001*	

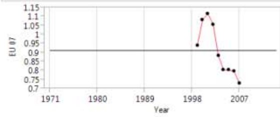
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	-0.1866	0.3980	0.5281	1	-0.1866
2	-0.0846	0.4934	0.7814	2	-0.1237
3	-0.1880	1.0589	0.7870	3	-0.2408
4	0.1035	1.2731	0.8659	4	-0.0013
5	0.1487	1.8630	0.8678	5	0.1341
6	-0.3092	5.6869	0.4592	6	-0.3095
7	0.0162	5.7078	0.5743	7	-0.0642
8	0.0000	.	.	8	-0.0253
9	0.0000	.	.	9	-0.1989
10	0.0000	.	.	10	-0.0380
11	0.0000	.	.	11	0.0559
12	0.0000	.	.	12	-0.1684
13	0.0000	.	.	13	-0.0360
14	0.0000	.	.	14	0.0126
15	0.0000	.	.	15	-0.1433
16	0.0000	.	.	16	-0.0392
17	0.0000	.	.	17	0.0296
18	0.0000	.	.	18	-0.1196
19	0.0000	.	.	19	-0.0324
20	0.0000	.	.	20	0.0203
21	0.0000	.	.	21	-0.1059
22	0.0000	.	.	22	-0.0352
23	0.0000	.	.	23	0.0218
24	0.0000	.	.	24	-0.0922
25	0.0000	.	.	25	-0.0319

Time Series EU 07



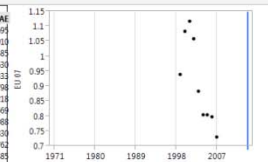
Mean	0.9125136
Std	0.1351734
N	9
Zero Mean ADF	-0.836752
Single Mean ADF	-0.341099
Trend ADF	-3.118642

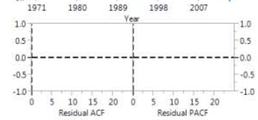
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.6929	5.9417	0.0148*	1	0.6929
2	0.2691	6.9659	0.0307*	2	-0.4059
3	-0.0971	7.1214	0.0681	3	-0.1796
4	-0.3236	9.1943	0.0564	4	-0.1177
5	-0.4374	13.9290	0.0161*	5	-0.1842
6	-0.3662	18.3540	0.0054*	6	0.0632
7	-0.2087	20.5093	0.0046*	7	-0.0513
8	-0.0292	20.5936	0.0083*	8	-0.0002
9	0.0000	.	.	9	-0.2708
10	0.0000	.	.	10	0.0070
11	0.0000	.	.	11	-0.0162
12	0.0000	.	.	12	-0.0637
13	0.0000	.	.	13	0.0030
14	0.0000	.	.	14	-0.1253
15	0.0000	.	.	15	-0.0355
16	0.0000	.	.	16	-0.0658
17	0.0000	.	.	17	0.0179
18	0.0000	.	.	18	-0.0514
19	0.0000	.	.	19	-0.0655
20	0.0000	.	.	20	-0.0243
21	0.0000	.	.	21	-0.0635
22	0.0000	.	.	22	-0.0001
23	0.0000	.	.	23	-0.0413
24	0.0000	.	.	24	-0.0286
25	0.0000	.	.	25	-0.0461

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	6	0.0046715	-17.57613	-16.98445	0.710	-23.57613	0.176403	6.479836	0.057695
☐	☐	MA(2)	6	0.0043371	-16.77993	-16.18826	0.716	-22.77993	0.118472	6.188534	0.057910
☐	☐	ARMA(1, 2)	5	0.0038346	-16.36038	-15.57148	0.734	-24.36038	0.096053	5.498838	0.050585
☐	☐	ARMA(2, 1)	5	0.0052349	-15.95022	-15.16132	0.711	-23.95022	0.078243	6.292464	0.056630
☐	☐	ARI(2, 1)	5	0.0049747	-15.75505	-15.51672	0.725	-21.75505	0.070968	6.120044	0.057333
☐	☐	ARMA(2, 2)	4	0.0045337	-15.25092	-14.26480	0.744	-25.25092	0.055156	5.745807	0.051798
☐	☐	IMA(1, 2)	5	0.0042322	-15.14938	-14.91105	0.721	-21.14938	0.052426	6.610282	0.062218
☐	☐	ARMA(1, 1)	6	0.0068292	-15.11746	-14.52579	0.685	-21.11746	0.051596	6.033481	0.055569
☐	☐	IMA(1, 1)	6	0.0071668	-14.64629	-14.48740	0.691	-18.64629	0.040766	5.882014	0.054988
☐	☐	ARIMA(2, 1, 1	4	0.0039632	-14.56642	-14.24866	0.716	-22.56642	0.039170	5.424825	0.051830
☐	☐	I(1)	7	0.0087544	-14.27086	-14.19142	0.626	-16.27086	0.033789	7.344075	0.068762
☐	☐	AR(1)	7	0.0093183	-13.90303	-13.50858	0.590	-17.90303	0.028113	7.840465	0.071485
☐	☐	ARI(1, 1)	6	0.0081524	-13.76297	-13.60408	0.661	-17.76297	0.026211	6.958843	0.065160
☐	☐	MA(1)	7	0.0085341	-13.29154	-12.89710	0.527	-17.29154	0.020707	8.967774	0.082401
☐	☐	I(2)	6	0.0077663	-13.21962	-13.27371	0.639	-15.21962	0.019976	8.409756	0.073610
☐	☐	ARIMA(1, 1, 2	4	0.0053064	-13.15038	-12.83262	0.721	-21.15038	0.019296	6.593403	0.062066
☐	☐	ARIMA(1, 1, 1	5	0.0078115	-13.13728	-12.89896	0.691	-19.13728	0.019170	6.656441	0.062364
☐	☐	IMA(2, 1)	5	0.0076969	-12.37488	-12.48306	0.695	-16.37488	0.013094	6.843658	0.059520
☐	☐	ARI(1, 2)	5	0.0081107	-12.06654	-12.17472	0.681	-16.06654	0.011223	7.183023	0.061992
☐	☐	ARIMA(2, 2, 1	3	0.0056998	-11.22694	-11.44330	0.777	-19.22694	0.007376	5.439897	0.049868
☐	☐	ARI(2, 2)	4	0.0085656	-10.99653	-11.15880	0.722	-16.99653	0.006573	6.175994	0.055169
☐	☐	ARIMA(1, 2, 1	4	0.0095679	-10.39747	-10.55973	0.696	-16.39747	0.004872	6.622173	0.057582
☐	☐	IMA(2, 2)	4	0.0068817	-9.908821	-10.07109	0.665	-15.90882	0.003816	7.769934	0.069355
☐	☐	ARIMA(2, 1, 2	3	0.0143831	-9.077216	-8.680008	0.736	-19.07722	0.002518	6.875452	0.061737
☐	☐	ARIMA(0, 0, 0	8	0.0205558	-8.480653	-8.283429	0.000	-10.48065	0.001868	13.416242	0.121480
☐	☐	ARIMA(1, 2, 2	3	0.0131543	-8.382978	-8.599337	0.694	-16.38298	0.001779	6.818687	0.059075
☐	☐	ARIMA(2, 2, 2	2	0.0232989	-5.219652	-5.490101	0.639	-15.21965	0.000366	8.409739	0.073610





Model: AR(2)

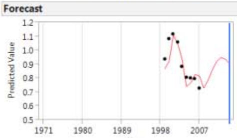
Model Summary

DF	6	Stable	Yes
Sum of Squared Errors	0.02802871	Invertible	Yes
Variance Estimate	0.00467145		
Standard Deviation	0.06834801		
Akaike's 'A' Information Criterion	-17.576129		
Schwarz's Bayesian Criterion	-16.984455		
RSquare	0.70955817		
RSquare Adj	0.61274423		
MAPE	6.47983629		
MAE	0.05769506		
-2LogLikelihood	-23.576129		

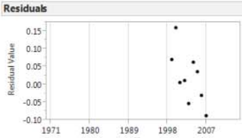
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.393677	0.2078676	6.70	0.0005*	0.3361266
AR2	2	-0.780691	0.1936742	-4.03	0.0069*	
Intercept	0	0.868513	0.0551555	15.75	<.0001*	

Forecast

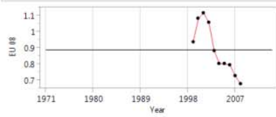


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.1805	0.4030	0.5255	1	0.1805
2	-0.1482	0.7137	0.6999	2	-0.1869
3	-0.2820	2.0257	0.5671	3	-0.2319
4	0.2349	3.1178	0.5383	4	0.3447
5	0.1427	3.6215	0.6051	5	-0.0603
6	-0.1047	3.9833	0.6789	6	-0.1773
7	-0.3987	11.8514	0.1056	7	-0.2089
8	-0.1244	13.3824	0.0994	8	-0.0693
9	0.0000	.	.	9	-0.1511
10	0.0000	.	.	10	-0.1374
11	0.0000	.	.	11	0.1903
12	0.0000	.	.	12	-0.0243
13	0.0000	.	.	13	-0.1098
14	0.0000	.	.	14	-0.0109
15	0.0000	.	.	15	-0.1029
16	0.0000	.	.	16	-0.1475
17	0.0000	.	.	17	-0.0527
18	0.0000	.	.	18	0.0703
19	0.0000	.	.	19	-0.0324
20	0.0000	.	.	20	-0.0413
21	0.0000	.	.	21	0.0317
22	0.0000	.	.	22	-0.0926
23	0.0000	.	.	23	-0.1153
24	0.0000	.	.	24	-0.0142
25	0.0000	.	.	25	-0.0032

Time Series EU 08



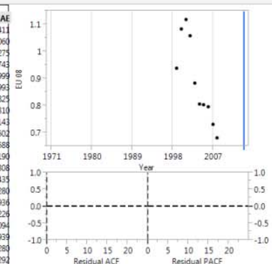
Mean	0.8891694
Std	0.1461138
N	10
Zero Mean ADF	-1.008536
Single Mean ADF	-0.203702
Trend ADF	-3.370159

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.7286	7.0782	0.0078*	1	0.7286
2	0.3281	8.6930	0.0130*	2	-0.4322
3	0.0259	8.7045	0.0335*	3	-0.0042
4	-0.1558	9.1901	0.0565	4	-0.1032
5	-0.3177	11.6131	0.0405*	5	-0.2701
6	-0.4411	17.4509	0.0078*	6	-0.1409
7	-0.3911	23.5707	0.0014*	7	0.1258
8	-0.2280	26.6902	0.0008*	8	-0.0457
9	-0.0487	26.9753	0.0014*	9	0.0256
10	0.0000	.	.	10	-0.2234
11	0.0000	.	.	11	-0.0211
12	0.0000	.	.	12	-0.1002
13	0.0000	.	.	13	-0.0432
14	0.0000	.	.	14	0.0278
15	0.0000	.	.	15	0.0107
16	0.0000	.	.	16	-0.1255
17	0.0000	.	.	17	-0.0326
18	0.0000	.	.	18	-0.0880
19	0.0000	.	.	19	-0.0038
20	0.0000	.	.	20	-0.0263
21	0.0000	.	.	21	-0.0038
22	0.0000	.	.	22	-0.0402
23	0.0000	.	.	23	-0.0511
24	0.0000	.	.	24	-0.0659
25	0.0000	.	.	25	-0.0037

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	7	0.0041425	-20.90957	-20.00182	0.750	-26.90957	0.173426	6.560421	0.057411
☐	☐	ARMA(1, 2)	6	0.0031831	-20.43415	-19.22381	0.786	-28.43415	0.136734	5.282358	0.048060
☐	☐	ARMA(2, 1)	6	0.0043293	-19.74169	-18.53135	0.760	-27.74169	0.096719	6.093910	0.054275
☐	☐	ARI(2, 1)	6	0.0043059	-19.49157	-18.89990	0.789	-25.49157	0.085349	5.874523	0.053743
☐	☐	MA(2)	7	0.0044189	-19.10502	-18.19726	0.749	-25.10502	0.070349	6.636241	0.059999
☐	☐	IMA(1, 2)	6	0.0035858	-18.91776	-18.32609	0.786	-24.91776	0.064061	6.146529	0.056993
☐	☐	ARIMA(2, 1, 1	5	0.0031157	-18.87505	-18.08615	0.778	-26.87505	0.062708	4.940098	0.046825
☐	☐	ARMA(1, 1)	7	0.0058115	-18.44689	-17.53913	0.738	-24.44689	0.050623	6.009069	0.054310
☐	☐	IMA(1, 1)	7	0.0061325	-18.09493	-17.70048	0.760	-22.09493	0.042454	5.264854	0.049143
☐	☐	I(1)	8	0.0077246	-17.28926	-17.09203	0.707	-19.28926	0.028377	6.867493	0.063502
☐	☐	ARI(1, 1)	7	0.0069788	-17.06861	-16.67416	0.734	-21.06861	0.025413	6.402010	0.059588
☐	☐	ARIMA(1, 1, 2	5	0.0043526	-16.94410	-16.15520	0.788	-24.9441	0.023879	6.044330	0.056190
☐	☐	ARMA(2, 2)	5	0.0079918	-16.84607	-15.33314	0.813	-26.84607	0.022737	5.333560	0.047308
☐	☐	ARIMA(1, 1, 1	6	0.0065125	-16.66851	-16.07684	0.761	-22.66851	0.020806	6.059828	0.056435
☐	☐	ARIMA(2, 1, 2	4	0.0023431	-16.25528	-15.26915	0.745	-26.25528	0.016922	5.647511	0.054280
☐	☐	AR(1)	8	0.0086985	-16.16671	-15.56154	0.649	-20.16671	0.016189	8.088094	0.071936
☐	☐	I(2)	7	0.0069276	-16.14320	-16.06376	0.708	-18.1432	0.016000	8.151651	0.070226
☐	☐	MA(1)	8	0.0084785	-15.15697	-14.55180	0.585	-19.15697	0.009771	9.268635	0.083094
☐	☐	IMA(2, 1)	6	0.0070226	-15.12312	-14.96424	0.741	-19.12312	0.009607	7.163346	0.060939
☐	☐	ARI(1, 2)	6	0.0073287	-14.83375	-14.67487	0.731	-18.83375	0.008313	7.592126	0.064280
☐	☐	ARI(2, 2)	5	0.0076506	-13.71270	-13.47437	0.759	-19.7127	0.004746	6.720209	0.058292
☐	☐	ARIMA(2, 2, 1	4	0.0060218	-13.17135	-12.85359	0.781	-21.17135	0.003621	6.279219	0.055343
☐	☐	IMA(2, 2)	5	0.0083526	-13.15081	-12.91249	0.741	-19.15081	0.003584	7.178093	0.060764
☐	☐	ARIMA(1, 2, 1	5	0.0084121	-13.12919	-12.89087	0.741	-19.12919	0.003545	7.158251	0.060819
☐	☐	ARIMA(1, 2, 2	4	0.0082476	-12.06308	-11.74531	0.766	-20.06308	0.002080	7.035683	0.061286
☐	☐	ARIMA(2, 2, 2	3	0.0042344	-11.66007	-11.26287	0.782	-21.66007	0.001701	6.697853	0.058556
☐	☐	ARIMA(0, 0, 0	9	0.0237214	-8.088617	-7.786032	-0.00	-10.08862	0.000285	14.603805	0.128007



Model: AR(2)

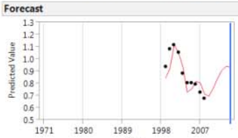
Model Summary

DF	7	Stable	Yes
Sum of Squared Errors	0.02899769	Invertible	Yes
Variance Estimate	0.00414253		
Standard Deviation	0.06436247		
Akaike's 'A' Information Criterion	-20.909573		
Schwarz's Bayesian Criterion	-20.001818		
RSquare	0.74997794		
RSquare Adj	0.67854307		
MAPE	6.56042128		
MAE	0.05741091		
-2LogLikelihood	-26.909573		

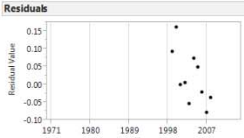
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.461853	0.1810790	8.07	<.0001*	0.28898462
AR2	2	-0.803227	0.1758923	-4.57	0.0026*	
Intercept	0	0.846534	0.0560032	15.12	<.0001*	

Forecast

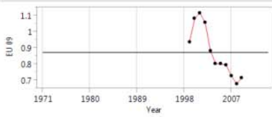


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.2917	1.1348	0.2868	1	0.2917
2	-0.1520	1.4814	0.4768	2	-0.2592
3	-0.3400	3.4628	0.3256	3	-0.2443
4	0.1291	3.7963	0.4343	4	0.3464
5	0.2893	5.8043	0.3257	5	0.0668
6	-0.0184	5.8145	0.4443	6	-0.2844
7	-0.3153	9.7900	0.2008	7	-0.0667
8	-0.3026	15.2827	0.0539	8	-0.0959
9	-0.0819	16.0876	0.0651	9	-0.2343
10	0.0000	.	.	10	-0.1245
11	0.0000	.	.	11	0.0897
12	0.0000	.	.	12	0.0644
13	0.0000	.	.	13	-0.0691
14	0.0000	.	.	14	-0.0037
15	0.0000	.	.	15	-0.0057
16	0.0000	.	.	16	-0.1811
17	0.0000	.	.	17	-0.1420
18	0.0000	.	.	18	0.0183
19	0.0000	.	.	19	-0.0144
20	0.0000	.	.	20	-0.0431
21	0.0000	.	.	21	0.0552
22	0.0000	.	.	22	0.0293
23	0.0000	.	.	23	-0.1036
24	0.0000	.	.	24	-0.0940
25	0.0000	.	.	25	-0.0239

Time Series EU 09



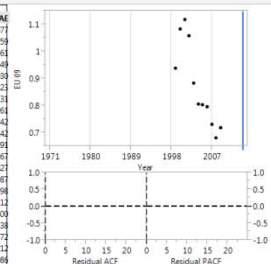
Mean	0.8735738
Std	0.1477858
N	11
Zero Mean ADF	-0.902945
Single Mean ADF	-0.531371
Trend ADF	-3.049648

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.7933	8.9985	0.0027*	1	0.7933
2	0.4015	11.5598	0.0031*	2	-0.6144
3	0.0799	11.6739	0.0086*	3	0.2301
4	-0.0927	11.8494	0.0185*	4	-0.1092
5	-0.2321	13.1335	0.0222*	5	-0.3960
6	-0.3884	17.4472	0.0078*	6	-0.0703
7	-0.4636	25.1297	0.0007*	7	0.1174
8	-0.3669	31.5452	0.0001*	8	0.0439
9	-0.1888	34.0939	<.0001*	9	-0.1930
10	-0.0423	34.3495	0.0002*	10	0.1155
11	0.0000	.	.	11	-0.2223
12	0.0000	.	.	12	-0.0332
13	0.0000	.	.	13	-0.1073
14	0.0000	.	.	14	-0.0195
15	0.0000	.	.	15	0.1064
16	0.0000	.	.	16	-0.1103
17	0.0000	.	.	17	-0.0376
18	0.0000	.	.	18	-0.0740
19	0.0000	.	.	19	0.0106
20	0.0000	.	.	20	-0.1629
21	0.0000	.	.	21	0.0636
22	0.0000	.	.	22	0.0175
23	0.0000	.	.	23	-0.0808
24	0.0000	.	.	24	0.0005
25	0.0000	.	.	25	-0.0807

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	8	0.0036497	-24.83452	-23.64083	0.781	-30.83452	0.198685	6.196460	0.053677
☐	☐	ARMA(1, 2)	7	0.0027507	-24.67754	-23.08596	0.814	-32.67754	0.183686	4.901817	0.044259
☐	☐	ARMA(2, 1)	7	0.0037286	-23.78702	-22.19544	0.790	-31.78702	0.117680	5.715687	0.050461
☐	☐	ARMA(2, 2)	6	0.0031395	-23.10063	-21.11115	0.802	-33.10063	0.083494	5.458208	0.048549
☐	☐	MA(2)	8	0.0038793	-22.85894	-21.66525	0.772	-28.85894	0.073990	6.196305	0.055930
☐	☐	IMA(1, 2)	7	0.0032142	-22.55330	-21.64554	0.809	-28.5533	0.063504	5.957624	0.054323
☐	☐	ARI(2, 1)	7	0.0040854	-22.46771	-21.55995	0.804	-28.46771	0.060844	6.092289	0.054131
☐	☐	ARMA(1, 1)	8	0.0050656	-22.13935	-20.94566	0.768	-28.13935	0.051632	5.587036	0.050261
☐	☐	ARIMA(2, 1, 1	6	0.0032425	-21.50585	-20.29551	0.800	-29.50585	0.037614	5.406911	0.048242
☐	☐	IMA(1, 1)	8	0.0056187	-21.05000	-20.44483	0.774	-25.05	0.029948	5.664314	0.051142
☐	☐	I(1)	9	0.0073205	-19.84558	-19.54300	0.720	-21.84558	0.016399	7.150341	0.063891
☐	☐	ARI(1, 1)	8	0.0067142	-19.58286	-18.97769	0.748	-23.58286	0.014381	6.740973	0.060467
☐	☐	ARIMA(1, 1, 1	7	0.0059827	-19.54846	-18.64071	0.778	-25.54846	0.014136	6.146748	0.055627
☐	☐	AR(1)	9	0.0077385	-19.33479	-18.53900	0.689	-23.33479	0.012703	7.455266	0.066087
☐	☐	ARIMA(2, 1, 2	5	0.0027814	-18.59101	-17.07809	0.786	-28.59101	0.008758	5.853209	0.052298
☐	☐	ARIMA(1, 1, 2	6	0.0059934	-18.20517	-16.99483	0.794	-26.20517	0.007221	5.119061	0.046112
☐	☐	I(2)	8	0.0074845	-17.57349	-17.37626	0.674	-19.57349	0.005266	8.681274	0.073600
☐	☐	MA(1)	9	0.0081026	-17.47705	-16.68126	0.600	-21.47705	0.005018	9.143856	0.081338
☐	☐	IMA(2, 1)	7	0.0070055	-17.13067	-16.73622	0.723	-21.13067	0.004220	7.598842	0.063572
☐	☐	ARI(1, 2)	7	0.0075675	-16.53784	-16.14339	0.705	-20.53784	0.003137	8.382760	0.069712
☐	☐	ARI(2, 2)	6	0.0070799	-16.12841	-15.53673	0.750	-22.12841	0.002557	6.769551	0.058086
☐	☐	ARIMA(2, 2, 1	5	0.0060062	-14.81284	-14.02395	0.750	-22.81284	0.001324	7.443581	0.063895
☐	☐	IMA(2, 2)	6	0.0069607	-14.73218	-14.14050	0.697	-20.73218	0.001272	7.527869	0.065336
☐	☐	ARIMA(1, 2, 1	6	0.007895	-14.48509	-13.89342	0.702	-20.48509	0.001124	8.573443	0.071433
☐	☐	ARIMA(1, 2, 2	5	0.0080414	-13.91226	-13.12337	0.743	-21.91226	0.000844	7.159403	0.061230
☐	☐	ARIMA(2, 2, 2	4	0.0076433	-12.84666	-11.86054	0.753	-22.84666	0.000495	7.365964	0.063261
☐	☐	ARIMA(0, 0, 0	10	0.0240247	-8.847162	-8.449267	0.000	-10.84716	0.000067	14.900603	0.129483



Model: AR(2)

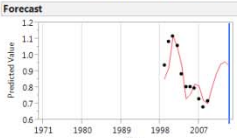
Model Summary

DF	8	Stable	Yes
Sum of Squared Errors	0.02919726	Invertible	Yes
Variance Estimate	0.00364966		
Standard Deviation	0.06041239		
Akaike's 'A' Information Criterion	-24.834518		
Schwarz's Bayesian Criterion	-23.640832		
RSquare	0.78055868		
RSquare Adj	0.72569835		
MAPE	6.19645991		
MAE	0.0536773		
-2LogLikelihood	-30.834518		

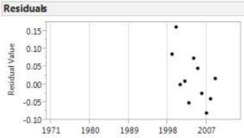
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.451413	0.1625288	8.93	<.0001*	0.30986374
AR2	2	-0.814136	0.1663899	-4.89	0.0012*	
Intercept	0	0.854272	0.0455723	18.75	<.0001*	

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.2914	1.2142	0.2705	1	0.2914
2	-0.1272	1.4713	0.4792	2	-0.2318
3	-0.3248	3.3570	0.3398	3	-0.2444
4	0.1381	3.7467	0.4414	4	0.3552
5	0.2726	5.5183	0.3559	5	0.0569
6	-0.0370	5.5575	0.4745	6	-0.3021
7	-0.3246	9.3238	0.2302	7	-0.0699
8	-0.3043	13.7372	0.0889	8	-0.1017
9	-0.0827	14.2264	0.1145	9	-0.2353
10	-0.0015	14.2267	0.1629	10	-0.1027
11	0.0000	.	.	11	0.1028
12	0.0000	.	.	12	0.0623
13	0.0000	.	.	13	-0.0696
14	0.0000	.	.	14	-0.0112
15	0.0000	.	.	15	-0.0241
16	0.0000	.	.	16	-0.1899
17	0.0000	.	.	17	-0.1330
18	0.0000	.	.	18	0.0289
19	0.0000	.	.	19	-0.0076
20	0.0000	.	.	20	-0.0307
21	0.0000	.	.	21	0.0586
22	0.0000	.	.	22	0.0124
23	0.0000	.	.	23	-0.1176
24	0.0000	.	.	24	-0.0960
25	0.0000	.	.	25	-0.0270

Time Series EU 10

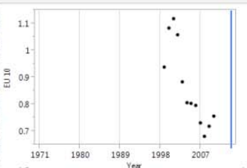
Mean	0.8636169
Std	0.1452967
N	12
Zero Mean ADF	-0.794678
Single Mean ADF	-0.74506
Trend ADF	-2.298166

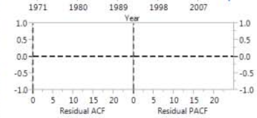
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8229	10.3419	0.0013*	1	0.8229
2	0.4670	14.0064	0.0009*	2	-0.6508
3	0.1360	14.3519	0.0025*	3	0.1995
4	-0.0610	14.4301	0.0060*	4	0.0159
5	-0.1944	15.3374	0.0090*	5	-0.4231
6	-0.3378	18.5330	0.0050*	6	-0.1570
7	-0.4415	25.0811	0.0007*	7	0.2147
8	-0.4298	32.8379	<.0001*	8	-0.0652
9	-0.2908	37.5741	<.0001*	9	-0.0265
10	-0.1382	39.1785	<.0001*	10	-0.1489
11	-0.0325	39.3555	<.0001*	11	0.1570
12	0.0000	.	.	12	-0.2669
13	0.0000	.	.	13	-0.1219
14	0.0000	.	.	14	0.1079
15	0.0000	.	.	15	-0.0432
16	0.0000	.	.	16	-0.0835
17	0.0000	.	.	17	0.0731
18	0.0000	.	.	18	-0.1167
19	0.0000	.	.	19	-0.0032
20	0.0000	.	.	20	-0.1271
21	0.0000	.	.	21	0.0242
22	0.0000	.	.	22	-0.0317
23	0.0000	.	.	23	-0.0399
24	0.0000	.	.	24	0.0257
25	0.0000	.	.	25	-0.0415

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARMA(1, 2)	8	0.0024356	-28.84684	-26.90722	0.814	-36.84684	0.254129	4.824909	0.043329
☐	☐	AR(2)	9	0.0034626	-28.34876	-26.89404	0.780	-34.34876	0.198105	6.108651	0.052646
☐	☐	ARMA(2, 2)	7	0.0029778	-26.63569	-24.21116	0.799	-36.63569	0.084122	5.482839	0.048400
☐	☐	IMA(1, 2)	8	0.0028304	-26.61337	-25.41969	0.815	-32.61337	0.083188	5.570960	0.050557
☐	☐	ARI(2, 1)	8	0.0035621	-26.51398	-25.32029	0.811	-32.51398	0.079155	5.615331	0.049828
☐	☐	MA(2)	9	0.0035629	-26.42827	-24.97355	0.775	-32.42827	0.075835	5.987148	0.053870
☐	☐	ARMA(1, 1)	9	0.0044734	-25.93635	-24.48163	0.778	-31.93635	0.059299	5.193788	0.046679
☐	☐	ARIMA(2, 1, 1	7	0.0039294	-24.71485	-23.12327	0.809	-32.71485	0.032196	5.592052	0.049509
☐	☐	IMA(1, 1)	9	0.005002	-24.62240	-23.82661	0.785	-28.6224	0.030742	5.332650	0.047921
☐	☐	ARIMA(2, 1, 2	6	0.0032396	-24.05716	-22.06769	0.812	-34.05716	0.023173	5.227969	0.046751
☐	☐	ARIMA(1, 1, 1	8	0.0052388	-23.22459	-22.03090	0.788	-29.22459	0.015283	5.652728	0.051035
☐	☐	ARI(1, 1)	9	0.0059726	-22.96906	-22.17327	0.758	-26.96906	0.013450	6.426930	0.057397
☐	☐	AR(1)	10	0.0069841	-22.57733	-21.60752	0.706	-26.57733	0.011057	6.960582	0.061472
☐	☐	I(1)	10	0.0069004	-22.56962	-22.17172	0.721	-24.56962	0.011015	7.164218	0.062924
☐	☐	I(2)	9	0.0066623	-20.78780	-20.48521	0.686	-22.7878	0.004519	7.906903	0.067016
☐	☐	ARIMA(1, 1, 2	7	0.0048929	-20.66657	-19.07499	0.783	-28.66657	0.004253	5.434886	0.048614
☐	☐	IMA(2, 1)	8	0.006213	-20.43685	-19.83168	0.731	-24.43685	0.003792	7.159163	0.059441
☐	☐	MA(1)	10	0.0074709	-20.32934	-19.35952	0.609	-24.32934	0.003593	8.725045	0.077490
☐	☐	ARI(1, 2)	8	0.0067107	-19.78507	-19.17990	0.714	-23.78507	0.002737	7.817558	0.064754
☐	☐	ARI(2, 2)	7	0.0061419	-19.57671	-18.66896	0.758	-25.57671	0.002466	6.355265	0.054230
☐	☐	ARMA(2, 1)	8	0.0089536	-19.39939	-17.45976	0.717	-27.39939	0.002257	6.703237	0.058705
☐	☐	ARIMA(2, 2, 1	6	0.0049274	-18.63089	-17.42055	0.758	-26.63089	0.001537	6.733946	0.057782
☐	☐	ARIMA(1, 2, 1	7	0.0071004	-18.43687	-17.52911	0.731	-24.43687	0.001395	7.160677	0.059450
☐	☐	IMA(2, 2)	7	0.0050044	-18.21349	-17.30573	0.712	-24.21349	0.001248	7.176856	0.059048
☐	☐	ARIMA(1, 2, 2	6	0.0066761	-17.46900	-16.25866	0.752	-25.469	0.000860	6.457973	0.055230
☐	☐	ARIMA(2, 2, 2	5	0.0059888	-16.64862	-15.13569	0.761	-26.64862	0.000570	6.689002	0.057410
☐	☐	ARIMA(0, 0, 0	11	0.0230303	-10.24094	-9.756029	0.000	-12.24094	0.000023	14.618573	0.126991





Model: ARMA(1, 2)

Model Summary

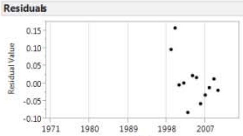
DF	8	Stable	Yes
Sum of Squared Errors	0.01948502	Invertible	Yes
Variance Estimate	0.00243563		
Standard Deviation	0.04935208		
Akaike's 'A' Information Criterion	-28.846843		
Schwarz's Bayesian Criterion	-26.907216		
RSquare	0.8137123		
RSquare Adj	0.74385441		
MAPE	4.82490892		
MAE	0.04332947		
-2LogLikelihood	-36.846843		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	0.583906	0.2167204	2.69	0.0273*	0.35007329
MA1	1	-1.262160	0.2987922	-4.22	0.0029*	
MA2	2	-0.999999	0.3684255	-2.71	0.0265*	
Intercept	0	0.841333	0.0778385	10.81	<.0001*	

Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.2964	1.3421	0.2467	1	0.2964
2	-0.0263	1.3537	0.5082	2	-0.1252
3	-0.1815	1.9687	0.5789	3	-0.1510
4	-0.0066	1.9697	0.7413	4	0.1064
5	0.1139	2.2812	0.8090	5	0.0779
6	-0.2005	3.4067	0.7563	6	-0.3376
7	-0.2014	4.7697	0.6880	7	-0.0180
8	-0.1456	5.6604	0.6852	8	-0.0301
9	-0.0161	5.6750	0.7720	9	-0.1006
10	-0.0791	6.2001	0.7982	10	-0.1481
11	-0.0532	6.6757	0.8247	11	0.0839
12	0.0000	.	.	12	-0.0547
13	0.0000	.	.	13	-0.1219
14	0.0000	.	.	14	-0.0194
15	0.0000	.	.	15	0.0334
16	0.0000	.	.	16	-0.1465
17	0.0000	.	.	17	-0.0390
18	0.0000	.	.	18	0.0311
19	0.0000	.	.	19	-0.0654
20	0.0000	.	.	20	-0.0944
21	0.0000	.	.	21	0.0376
22	0.0000	.	.	22	-0.0293
23	0.0000	.	.	23	-0.0932
24	0.0000	.	.	24	-0.0113
25	0.0000	.	.	25	0.0198

Time Series EU 11

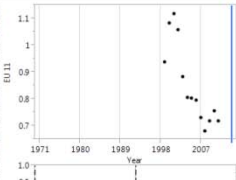
Mean	0.852402
Std	0.1449016
N	13
Zero Mean ADF	-0.919709
Single Mean ADF	-0.706479
Trend ADF	-2.177969

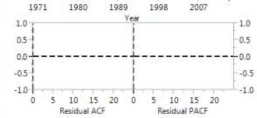
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8187	10.8917	0.0010*	1	0.8187
2	0.5029	15.3755	0.0005*	2	-0.5075
3	0.2114	16.2472	0.0010*	3	0.0254
4	0.0008	16.2472	0.0027*	4	-0.0517
5	-0.1543	16.8279	0.0048*	5	-0.1574
6	-0.2866	19.1155	0.0040*	6	-0.1629
7	-0.3786	23.7744	0.0012*	7	-0.0555
8	-0.4054	30.1827	0.0002*	8	-0.0390
9	-0.3653	36.6895	<.0001*	9	-0.0326
10	-0.2562	40.9570	<.0001*	10	0.0842
11	-0.1449	43.0033	<.0001*	11	-0.1250
12	-0.0426	43.3564	<.0001*	12	0.0551
13	0.0000	.	.	13	-0.2070
14	0.0000	.	.	14	-0.0268
15	0.0000	.	.	15	-0.0010
16	0.0000	.	.	16	-0.0823
17	0.0000	.	.	17	-0.0082
18	0.0000	.	.	18	-0.0037
19	0.0000	.	.	19	-0.0126
20	0.0000	.	.	20	-0.0776
21	0.0000	.	.	21	0.0065
22	0.0000	.	.	22	-0.0981
23	0.0000	.	.	23	0.0003
24	0.0000	.	.	24	-0.0420
25	0.0000	.	.	25	-0.0242

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARMA(1, 2)	9	0.0024656	-31.51311	-29.25331	0.795	-39.51311	0.203773	5.213513	0.046001
☐	☐	ARI(2, 1)	9	0.0031382	-30.63599	-29.18127	0.821	-36.63599	0.131426	5.247665	0.046470
☐	☐	ARIMA(2, 1, 1	8	0.0024565	-29.97981	-28.04019	0.820	-37.97981	0.094666	4.980068	0.043873
☐	☐	IMA(1, 2)	9	0.0027136	-29.97393	-28.51921	0.814	-35.97393	0.094388	5.710870	0.050713
☐	☐	AR(2)	10	0.0039733	-29.71756	-28.02271	0.756	-35.71756	0.083032	6.451836	0.054948
☐	☐	ARMA(2, 1)	9	0.0037197	-29.41105	-27.15126	0.767	-37.41105	0.071235	5.890303	0.051265
☐	☐	ARMA(1, 1)	10	0.0043205	-28.90473	-27.20988	0.771	-34.90473	0.055302	5.413390	0.047792
☐	☐	ARIMA(2, 1, 2	7	0.0027399	-28.52076	-26.09623	0.823	-38.52076	0.045642	4.823200	0.043145
☐	☐	MA(2)	10	0.0037652	-28.30458	-26.60974	0.755	-34.30458	0.040966	6.353215	0.056427
☐	☐	ARMA(2, 2)	8	0.0033956	-28.23309	-25.40834	0.781	-38.23309	0.039527	5.625379	0.049047
☐	☐	IMA(1, 1)	10	0.0046418	-27.98294	-27.01313	0.793	-31.98294	0.034880	5.323245	0.046975
☐	☐	ARIMA(1, 1, 2	8	0.0030427	-27.97649	-26.03686	0.813	-35.97649	0.034768	5.728846	0.050861
☐	☐	ARIMA(1, 1, 1	9	0.0048738	-26.47322	-25.01850	0.792	-32.47322	0.016396	5.523759	0.049024
☐	☐	ARI(1, 1)	10	0.0056987	-25.88183	-24.91201	0.764	-29.88183	0.012199	6.294567	0.055093
☐	☐	I(1)	11	0.0063048	-25.78699	-25.30208	0.738	-27.78699	0.011634	6.786377	0.059304
☐	☐	AR(1)	11	0.0065492	-25.42896	-24.29906	0.712	-29.42896	0.009727	7.044361	0.061468
☐	☐	IMA(2, 1)	9	0.0057061	-23.54296	-22.74716	0.739	-27.54296	0.003788	6.940783	0.056670
☐	☐	I(2)	10	0.0063448	-23.49307	-23.09517	0.688	-25.49307	0.003695	8.085163	0.067066
☐	☐	ARI(2, 2)	8	0.0053651	-23.16318	-21.96949	0.771	-29.16318	0.003133	5.990443	0.050833
☐	☐	ARIMA(2, 2, 1	7	0.0041488	-22.55077	-20.95919	0.771	-30.55077	0.002307	6.190682	0.053002
☐	☐	ARI(1, 2)	9	0.0063578	-22.52234	-21.72655	0.714	-26.52234	0.002274	7.732008	0.062870
☐	☐	MA(1)	11	0.0075934	-22.08648	-20.95658	0.594	-26.08648	0.001829	8.726694	0.076942
☐	☐	IMA(2, 2)	8	0.0044599	-21.72657	-20.53288	0.729	-27.72657	0.001528	6.793890	0.055292
☐	☐	ARIMA(2, 2, 2	6	0.0048893	-20.56219	-18.57271	0.773	-30.56219	0.000853	6.153035	0.052702
☐	☐	ARIMA(1, 2, 2	7	0.0073029	-19.57082	-17.97924	0.739	-27.57082	0.000520	6.934649	0.056641
☐	☐	ARIMA(1, 2, 1	8	0.007931	-19.49307	-18.29938	0.688	-25.49307	0.000500	8.085163	0.067066
☐	☐	ARIMA(0, 0, 0	12	0.0227462	-11.33181	-10.76686	0.000	-13.33181	0.000008	14.561214	0.125849





Model: ARMA(1, 2)

Model Summary

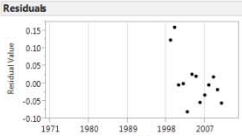
DF	9	Stable	Yes
Sum of Squared Errors	0.02219018	Invertible	Yes
Variance Estimate	0.00246558		
Standard Deviation	0.04965456		
Akaike's 'A' Information Criterion	-31.513107		
Schwarz's Bayesian Criterion	-29.25331		
RSquare	0.79507833		
RSquare Adj	0.72677111		
MAPE	5.21351255		
MAE	0.04600059		
-2LogLikelihood	-39.513107		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	0.629527	0.2088167	3.01	0.0146*	0.30198781
MA1	1	-1.220162	0.2853235	-4.28	0.0021*	
MA2	2	-0.999996	0.3573040	-2.80	0.0208*	
Intercept	0	0.815141	0.0860141	9.48	<.0001*	

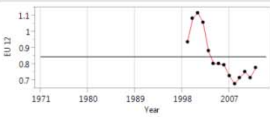
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3320	1.7911	0.1808	1	0.3320
2	-0.0874	1.9265	0.3816	2	-0.2221
3	-0.1653	2.4596	0.4826	3	-0.0664
4	0.0089	2.4613	0.6516	4	0.0932
5	0.1839	3.2858	0.6560	5	0.1332
6	-0.1712	4.1027	0.6628	6	-0.3590
7	-0.2207	5.6850	0.5770	7	0.0302
8	-0.0133	5.6919	0.6817	8	0.1128
9	0.0209	5.7132	0.7682	9	-0.1706
10	-0.0305	5.7734	0.8339	10	-0.0906
11	-0.2248	10.7018	0.4686	11	-0.0600
12	-0.1324	14.1203	0.2931	12	-0.0433
13	0.0000	.	.	13	-0.1319
14	0.0000	.	.	14	0.0046
15	0.0000	.	.	15	0.0201
16	0.0000	.	.	16	-0.0070
17	0.0000	.	.	17	-0.1254
18	0.0000	.	.	18	-0.0138
19	0.0000	.	.	19	0.0334
20	0.0000	.	.	20	-0.1025
21	0.0000	.	.	21	-0.0536
22	0.0000	.	.	22	0.0350
23	0.0000	.	.	23	-0.0472
24	0.0000	.	.	24	-0.1076
25	0.0000	.	.	25	0.0244

Time Series EU 12



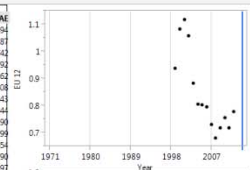
Mean	0.8470637
Std	0.140951
N	14
Zero Mean ADF	-0.722827
Single Mean ADF	-0.95081
Trend ADF	-1.643655

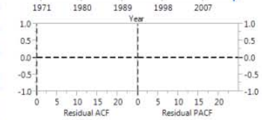
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8378	12.0953	0.0005*	1	0.8378
2	0.5163	17.0703	0.0002*	2	-0.6231
3	0.2367	18.2112	0.0004*	3	0.3110
4	0.0389	18.2452	0.0011*	4	-0.2999
5	-0.1242	18.6292	0.0023*	5	-0.1088
6	-0.2687	20.6509	0.0021*	6	-0.0942
7	-0.3591	24.7768	0.0008*	7	-0.0074
8	-0.3836	30.2699	0.0002*	8	-0.1247
9	-0.3624	36.1549	<.0001*	9	-0.0192
10	-0.2996	41.1817	<.0001*	10	0.0564
11	-0.2077	44.4033	<.0001*	11	-0.0927
12	-0.1015	45.5570	<.0001*	12	0.0757
13	-0.0229	45.6741	<.0001*	13	-0.2029
14	0.0000	.	.	14	-0.0357
15	0.0000	.	.	15	0.0230
16	0.0000	.	.	16	-0.1360
17	0.0000	.	.	17	0.0306
18	0.0000	.	.	18	-0.0148
19	0.0000	.	.	19	-0.0365
20	0.0000	.	.	20	-0.0588
21	0.0000	.	.	21	0.0272
22	0.0000	.	.	22	-0.0848
23	0.0000	.	.	23	-0.0362
24	0.0000	.	.	24	0.0035
25	0.0000	.	.	25	-0.0860

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	11	0.0039251	-32.71417	-30.79699	0.763	-38.71417	0.224739	6.466111	0.054494
☐	☐	ARMA(1, 2)	10	0.0030746	-32.04217	-29.48594	0.798	-40.04217	0.160604	5.499528	0.047187
☐	☐	ARMA(2, 2)	9	0.0031883	-31.74206	-28.54678	0.786	-41.74206	0.138226	5.670282	0.048742
☐	☐	ARMA(1, 1)	11	0.0044095	-31.50531	-29.58814	0.775	-37.50531	0.122795	5.635074	0.048792
☐	☐	MA(2)	11	0.0040797	-31.02384	-29.10667	0.737	-37.02384	0.096523	6.842497	0.060162
☐	☐	IMA(1, 1)	11	0.0050195	-29.59607	-28.46617	0.770	-33.59607	0.047271	5.705626	0.049508
☐	☐	ARI(2, 1)	10	0.0047244	-29.23084	-27.53599	0.786	-35.23084	0.039381	5.649389	0.048343
☐	☐	AR(1)	12	0.0061557	-28.53933	-27.26121	0.716	-32.53933	0.027869	6.853761	0.059344
☐	☐	IMA(1, 2)	10	0.0040273	-28.48195	-26.78710	0.773	-34.48195	0.027081	6.614007	0.057190
☐	☐	I(1)	12	0.0062504	-28.12466	-27.55971	0.721	-30.12466	0.022651	7.002833	0.060299
☐	☐	ARI(1, 1)	11	0.0057559	-28.08716	-26.95726	0.748	-32.08716	0.022230	6.570100	0.056654
☐	☐	ARIMA(1, 1, 1	10	0.0053582	-27.85517	-26.16032	0.771	-33.85517	0.019795	5.947197	0.051790
☐	☐	ARIMA(2, 1, 1	9	0.0052495	-27.23214	-24.97234	0.786	-35.23214	0.014497	5.658707	0.048397
☐	☐	ARIMA(1, 1, 2	9	0.0042705	-26.73689	-24.47709	0.777	-34.73689	0.011317	6.391323	0.055469
☐	☐	MA(1)	12	0.0069919	-25.20178	-23.92366	0.602	-29.20178	0.005253	8.350620	0.073231
☐	☐	ARMA(2, 1)	10	0.0076998	-25.11216	-22.55593	0.723	-33.11216	0.005023	6.578174	0.056249
☐	☐	I(2)	11	0.0068235	-24.83825	-24.35335	0.634	-26.83825	0.004380	8.344914	0.069293
☐	☐	IMA(2, 1)	10	0.0069116	-23.64854	-22.67873	0.655	-27.64854	0.002416	8.129160	0.066576
☐	☐	ARI(1, 2)	10	0.0073084	-23.12779	-22.15798	0.642	-27.12779	0.001862	8.488039	0.069789
☐	☐	ARI(2, 2)	9	0.0066166	-23.10705	-21.65233	0.690	-29.10705	0.001843	6.840678	0.058105
☐	☐	IMA(2, 2)	9	0.007295	-22.19894	-20.74422	0.669	-28.19894	0.001170	7.710765	0.064695
☐	☐	ARIMA(1, 2, 1	9	0.0070931	-21.62563	-20.17091	0.651	-27.62563	0.000879	7.696996	0.065230
☐	☐	ARIMA(2, 2, 1	8	0.0072376	-21.26547	-19.32584	0.689	-29.26547	0.000734	6.580762	0.056181
☐	☐	ARIMA(1, 2, 2	8	0.0067013	-21.20123	-19.26160	0.689	-29.20123	0.000711	6.916925	0.058640
☐	☐	ARIMA(2, 1, 2	8	0.0093755	-20.12466	-17.29991	0.721	-30.12466	0.000415	7.002833	0.060299
☐	☐	ARIMA(2, 2, 2	7	0.0068319	-19.62900	-17.20447	0.688	-29.629	0.000324	7.030505	0.059934
☐	☐	ARIMA(0, 0, 0	13	0.0213954	-13.13132	-12.49226	0.000	-15.13132	0.000013	13.939671	0.120673





Model: AR(2)

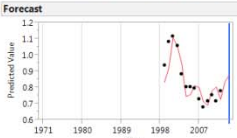
Model Summary

DF	11	Stable	Yes
Sum of Squared Errors	0.04317638	Invertible	Yes
Variance Estimate	0.00392513		
Standard Deviation	0.06265082		
Akaike's 'A' Information Criterion	-32.714166		
Schwarz's Bayesian Criterion	-30.796994		
RSquare	0.7634635		
RSquare Adj	0.72045686		
MAPE	6.46611098		
MAE	0.05449357		
-2LogLikelihood	-38.714166		

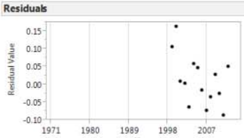
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.400394	0.1949652	7.18	<.0001*	0.25363562
AR2	2	-0.704895	0.2101165	-3.35	0.0064*	
Intercept	0	0.832956	0.0492502	16.91	<.0001*	

Forecast



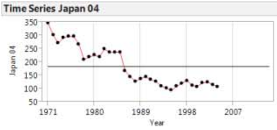
Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.2560	1.1296	0.2879	1	0.2560
2	-0.1538	1.5712	0.4559	2	-0.2347
3	-0.1312	1.9217	0.5888	3	-0.0255
4	0.1938	2.7629	0.5983	4	0.2336
5	0.2019	3.7774	0.5819	5	0.0515
6	-0.1194	4.1765	0.6528	6	-0.1677
7	-0.2474	6.1344	0.5241	7	-0.0985
8	-0.0862	6.4115	0.6012	8	-0.0362
9	-0.0630	6.5891	0.6798	9	-0.1950
10	-0.0662	6.8345	0.7410	10	-0.0254
11	-0.2894	13.0876	0.2876	11	-0.2505
12	-0.0521	13.3919	0.3412	12	0.1203
13	0.0569	14.1164	0.3657	13	-0.0340
14	0.0000	.	.	14	-0.0668
15	0.0000	.	.	15	0.1210
16	0.0000	.	.	16	-0.0288
17	0.0000	.	.	17	-0.1349
18	0.0000	.	.	18	-0.0595
19	0.0000	.	.	19	-0.0158
20	0.0000	.	.	20	-0.1559
21	0.0000	.	.	21	0.0381
22	0.0000	.	.	22	-0.0620
23	0.0000	.	.	23	0.0224
24	0.0000	.	.	24	0.0177
25	0.0000	.	.	25	-0.0688

Japan

Time Series Japan 04



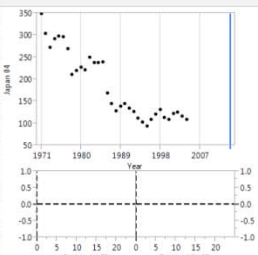
Mean	184.15165
Std	73.981697
N	34
Zero Mean ADF	-2.666736
Single Mean ADF	-2.102632
Trend ADF	-2.257782

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8686	27.9860	<.0001*	1	0.8686
2	0.7589	50.0156	<.0001*	2	0.0178
3	0.6887	68.7437	<.0001*	3	0.1050
4	0.6065	83.7517	<.0001*	4	-0.0681
5	0.5344	95.8045	<.0001*	5	0.0083
6	0.4421	104.349	<.0001*	6	-0.1342
7	0.3666	110.441	<.0001*	7	0.0112
8	0.3368	115.781	<.0001*	8	0.1168
9	0.2673	119.278	<.0001*	9	-0.1475
10	0.1733	120.809	<.0001*	10	-0.1388
11	0.0920	121.260	<.0001*	11	-0.0717
12	-0.0061	121.262	<.0001*	12	-0.1571
13	-0.0751	121.590	<.0001*	13	0.0057
14	-0.1552	123.065	<.0001*	14	-0.1069
15	-0.2553	127.263	<.0001*	15	-0.1325
16	-0.3071	133.678	<.0001*	16	0.0110
17	-0.3530	142.652	<.0001*	17	-0.0557
18	-0.3799	153.693	<.0001*	18	0.0548
19	-0.4039	167.004	<.0001*	19	-0.0528
20	-0.4029	181.197	<.0001*	20	0.1342
21	-0.3912	195.610	<.0001*	21	-0.0231
22	-0.3806	210.383	<.0001*	22	-0.0067
23	-0.3612	224.901	<.0001*	23	0.0777
24	-0.3433	239.330	<.0001*	24	-0.0387
25	-0.3068	252.135	<.0001*	25	0.0789

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARIMA(1, 2, 2	28	391.98471	290.90704	296.76998	0.902	282.90704	0.319651	8.730743	15.405294
☐	☐	IMA(2, 1)	30	461.93412	292.57681	295.50828	0.886	288.57681	0.138704	9.466018	16.559013
☐	☐	ARIMA(2, 2, 2	27	405.39521	292.89478	300.22346	0.902	282.89478	0.118316	8.793188	15.497274
☐	☐	IMA(2, 2)	29	460.74912	293.01943	297.41664	0.892	287.01943	0.111167	8.551324	15.216451
☐	☐	ARIMA(1, 2, 1	29	467.96917	293.54516	297.94236	0.890	287.54516	0.085471	8.731953	15.482178
☐	☐	ARIMA(2, 2, 1	28	456.08656	294.10489	299.96784	0.894	286.10489	0.064606	8.602994	15.271773
☐	☐	ARIMA(1, 1, 1	30	382.95739	295.02766	299.51718	0.921	289.02766	0.040728	8.533331	14.827376
☐	☐	IMA(1, 2)	30	401.78103	295.29886	299.78839	0.920	289.29886	0.035563	9.083407	15.358394
☐	☐	I(1)	32	456.24318	296.69433	298.19084	0.908	294.69433	0.017700	8.641131	15.364890
☐	☐	ARIMA(2, 1, 1	29	395.54554	297.01457	303.00061	0.921	289.01457	0.015081	8.609649	14.924639
☐	☐	IMA(1, 1)	31	447.97199	297.11973	300.11274	0.912	293.11973	0.014309	8.183737	14.609237
☐	☐	ARI(1, 1)	31	456.12209	297.67117	300.66418	0.911	293.67117	0.010861	8.245148	14.806362
☐	☐	ARIMA(1, 1, 2	29	402.51012	297.68722	303.67325	0.919	289.68722	0.010774	9.390180	15.697200
☐	☐	ARI(2, 1)	30	448.84876	298.15341	302.64293	0.914	292.15341	0.008534	8.171366	14.399400
☐	☐	ARIMA(2, 1, 2	28	408.63541	298.99667	306.47921	0.921	288.99667	0.005598	8.672763	14.993875
☐	☐	ARI(2, 2)	29	671.76516	302.21502	306.61223	0.862	296.21502	0.001120	10.114114	17.489919
☐	☐	ARI(1, 2)	30	696.98551	302.32652	305.25799	0.853	298.32652	0.001059	10.772615	18.567214
☐	☐	I(2)	31	736.61641	303.06226	304.52800	0.840	301.06226	0.000733	11.063540	19.171741
☐	☐	ARMA(2, 1)	30	427.58072	311.91549	318.02093	0.833	303.91549	0.000009	9.373596	18.179995
☐	☐	ARMA(1, 1)	31	491.25497	313.32684	317.90592	0.823	307.32684	0.000004	9.532552	18.467420
☐	☐	ARMA(2, 2)	29	442.30776	313.79929	321.43109	0.833	303.79929	0.000003	9.233138	18.009575
☐	☐	AR(2)	31	502.47802	314.04085	318.61993	0.823	308.04085	0.000003	9.674945	18.617459
☐	☐	AR(1)	32	522.73312	314.33568	317.38840	0.820	310.33568	0.000003	10.370550	19.359594
☐	☐	ARMA(1, 2)	30	439.27949	316.00884	322.11428	0.808	308.00884	0.000001	11.287522	21.585635
☐	☐	MA(2)	31	1148.4897	341.56133	346.14041	0.702	335.56133	0.000000	17.174790	29.233732
☐	☐	MA(1)	32	1738.8051	355.65431	358.70703	0.605	351.65431	0.000000	22.625906	38.018902
☐	☐	ARIMA(0, 0, 0	33	5639.1489	391.14743	392.67379	0.000	389.14743	0.000000	41.390195	67.814647



Model: ARIMA(1, 2, 2)

Model Summary

DF	28	Stable	Yes
Sum of Squared Errors	10975.5718	Invertible	Yes
Variance Estimate	391.984706		
Standard Deviation	19.7986036		
Akaike's 'A' Information Criterion	290.907038		
Schwarz's Bayesian Criterion	296.769982		
RSquare	0.9016529		
RSquare Adj	0.89111571		
MAPE	8.73074252		
MAE	15.4052944		
-2LogLikelihood	282.907038		

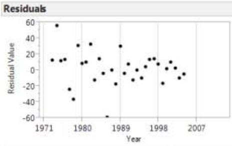
Failed: Cannot Decrease Objective Function Hessian is not positive definite.

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	-0.5958252	0.1489911	-4.00	0.0004*	0.82132663
MA1	1	5.28019e-7	.	.	.	
MA2	2	0.9999995	0.0070934	140.98	<.0001*	
Intercept	0	0.5146720	.	.	.	

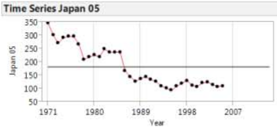
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0340	0.0406	0.8403	1	0.0340
2	0.0142	0.0479	0.9763	2	0.0131
3	-0.2027	1.5891	0.6619	3	-0.2039
4	-0.3780	7.1417	0.1286	4	-0.3803
5	0.0846	7.4299	0.1906	5	0.1101
6	0.0178	7.4431	0.2818	6	-0.0019
7	0.0040	7.4438	0.3842	7	-0.1865
8	0.3176	12.0164	0.1505	8	0.2735
9	0.0847	12.3554	0.1940	9	0.2216
10	-0.0277	12.3933	0.2596	10	-0.1624
11	-0.1305	13.2761	0.2757	11	-0.1165
12	-0.3153	18.6844	0.0964	12	-0.0008
13	-0.0101	18.6903	0.1330	13	-0.0189
14	-0.0375	18.7752	0.1737	14	-0.2567
15	0.0816	19.2009	0.2048	15	0.0141
16	0.0809	19.6461	0.2366	16	-0.0100
17	0.0768	20.0742	0.2705	17	-0.0288
18	-0.0549	20.3089	0.3157	18	-0.1702
19	-0.0687	20.7042	0.3534	19	0.0453
20	-0.1032	21.6693	0.3587	20	0.1015
21	0.0399	21.8264	0.4096	21	0.0568
22	0.0889	22.6871	0.4196	22	0.0131
23	0.0107	22.7010	0.4783	23	-0.0152
24	-0.0283	22.8099	0.5310	24	-0.0548
25	-0.0418	23.0822	0.5728	25	-0.0674

Time Series Japan 05



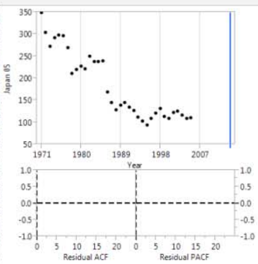
Mean	182.03609
Std	73.953246
N	35
Zero Mean ADF	-2.682178
Single Mean ADF	-2.182966
Trend ADF	-2.210136

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8720	28.9639	<.0001*	1	0.8720
2	0.7618	51.7405	<.0001*	2	0.0059
3	0.6898	70.9954	<.0001*	3	0.1011
4	0.6107	86.5758	<.0001*	4	-0.0536
5	0.5453	99.4136	<.0001*	5	0.0286
6	0.4529	108.574	<.0001*	6	-0.1552
7	0.3726	114.997	<.0001*	7	-0.0027
8	0.3478	120.799	<.0001*	8	0.1509
9	0.2852	124.851	<.0001*	9	-0.1469
10	0.1999	126.922	<.0001*	10	-0.1179
11	0.1183	127.677	<.0001*	11	-0.0875
12	0.0197	127.699	<.0001*	12	-0.1523
13	-0.0533	127.866	<.0001*	13	-0.0353
14	-0.1342	128.977	<.0001*	14	-0.0970
15	-0.2355	132.569	<.0001*	15	-0.1258
16	-0.2827	138.017	<.0001*	16	0.0551
17	-0.3226	145.503	<.0001*	17	-0.0429
18	-0.3538	155.041	<.0001*	18	0.0110
19	-0.3854	167.064	<.0001*	19	-0.0789
20	-0.4110	181.648	<.0001*	20	0.0427
21	-0.3994	196.400	<.0001*	21	0.0704
22	-0.3890	211.473	<.0001*	22	-0.0259
23	-0.3744	226.602	<.0001*	23	0.1057
24	-0.3459	240.687	<.0001*	24	0.0271
25	-0.3122	253.306	<.0001*	25	0.0305

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARIMA(1, 2, 2	29	378.46012	298.62273	304.60876	0.904	290.62273	0.385263	8.470386	14.943316
☐	☐	IMA(2, 1)	31	447.04864	300.50116	303.49417	0.889	296.50116	0.150613	9.202690	16.080970
☐	☐	IMA(2, 2)	30	445.5164	300.91636	305.40589	0.895	294.91636	0.122377	8.356862	14.820511
☐	☐	ARIMA(1, 2, 1	30	452.45076	301.45703	305.94655	0.893	295.45703	0.093389	8.542567	15.092487
☐	☐	ARIMA(2, 2, 1	29	440.29364	301.94703	307.93306	0.897	293.94703	0.073096	8.356056	14.823928
☐	☐	ARIMA(1, 1, 1	31	372.1367	302.87911	307.45819	0.923	296.87911	0.045867	8.459691	14.583430
☐	☐	IMA(1, 2)	31	389.89963	303.15983	307.73891	0.922	297.15983	0.039860	9.004457	15.132948
☐	☐	I(1)	33	444.91666	304.80098	306.32734	0.910	302.80098	0.017546	8.634677	15.168144
☐	☐	ARIMA(2, 1, 1	30	383.8385	304.86130	310.96674	0.923	296.8613	0.017024	8.542643	14.689408
☐	☐	ARIMA(2, 1, 2	29	358.51214	305.02772	312.65953	0.926	295.02772	0.015665	8.557063	14.422383
☐	☐	IMA(1, 1)	32	436.57447	305.18892	308.24165	0.914	301.18892	0.014452	8.148778	14.392896
☐	☐	ARI(1, 1)	32	444.62162	305.76512	308.81784	0.913	301.76512	0.010834	8.249768	14.633565
☐	☐	ARI(2, 1)	31	436.70004	306.17184	310.75092	0.916	300.17184	0.008841	8.136863	14.185724
☐	☐	ARIMA(1, 1, 2	30	389.11358	308.59886	314.70430	0.914	300.59886	0.002627	10.200424	16.527523
☐	☐	ARI(2, 2)	30	650.26051	310.49864	314.98816	0.865	304.49864	0.001016	9.960490	17.124375
☐	☐	ARI(1, 2)	31	676.92163	310.74930	313.74232	0.857	306.7493	0.000896	10.675015	18.264641
☐	☐	I(2)	32	715.83404	311.55827	313.05478	0.844	309.55827	0.000598	10.972008	18.874803
☐	☐	ARIMA(2, 2, 2	28	817.45362	319.53235	327.01489	0.844	309.53235	0.000011	10.964721	18.861867
☐	☐	ARMA(2, 1)	31	413.48441	319.70137	325.92276	0.837	311.70137	0.000010	9.126753	17.690125
☐	☐	ARMA(1, 1)	32	475.72362	321.25505	325.92109	0.828	315.25505	0.000005	9.270138	17.948594
☐	☐	AR(2)	32	486.65979	321.99321	326.65925	0.829	315.99321	0.000003	9.418028	18.097024
☐	☐	AR(1)	33	506.54834	322.35753	325.46822	0.825	318.35753	0.000003	10.081678	18.815625
☐	☐	ARMA(2, 2)	30	469.85092	323.71835	331.49509	0.839	313.71835	0.000001	9.016344	17.676499
☐	☐	ARMA(1, 2)	31	432.27378	324.34305	330.56444	0.819	316.34305	0.000001	11.302029	21.249106
☐	☐	MA(2)	32	1128.0736	350.78333	355.44938	0.706	344.78333	0.000000	17.089604	28.954092
☐	☐	MA(1)	33	1725.413	365.71255	368.82325	0.606	361.71255	0.000000	22.649692	37.890707
☐	☐	ARIMA(0, 0, 0	34	5629.938	402.56601	404.12136	0.000	400.56601	0.000000	41.480889	67.690427



Model: ARIMA(1, 2, 2)

Model Summary

DF	29	Stable	Yes
Sum of Squared Errors	10975.3434	Invertible	No
Variance Estimate	378.460118		
Standard Deviation	19.4540515		
Akaike's 'A' Information Criterion	298.622731		
Schwarz's Bayesian Criterion	304.608761		
RSquare	0.90441631		
RSquare Adj	0.89452834		
MAPE	8.47038606		
MAE	14.943316		
-2LogLikelihood	290.622731		

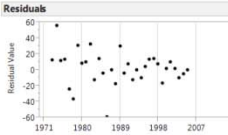
Failed: Cannot Decrease Objective Function Hessian is not positive definite.

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	-0.595376	0.1465827	-4.06	0.0003*	0.82226983
MA1	1	-2.697e-13	0.0000000	.	.	
MA2	2	1.000000	0.0067169	148.88	<.0001*	
Intercept	0	0.515408	.	.	.	

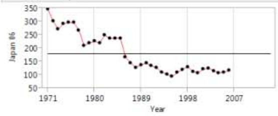
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0346	0.0432	0.8353	1	0.0346
2	0.0160	0.0527	0.9740	2	0.0148
3	-0.2028	1.6365	0.6511	3	-0.2042
4	-0.3792	7.3621	0.1179	4	-0.3813
5	0.0845	7.6566	0.1762	5	0.1117
6	0.0204	7.6743	0.2629	6	0.0032
7	0.0031	7.6747	0.3621	7	-0.1892
8	0.3156	12.2777	0.1392	8	0.2708
9	0.0828	12.6072	0.1812	9	0.2228
10	-0.0283	12.6473	0.2441	10	-0.1645
11	-0.1290	13.5210	0.2606	11	-0.1204
12	-0.3152	18.9849	0.0889	12	0.0011
13	-0.0082	18.9888	0.1235	13	-0.0129
14	-0.0383	19.0779	0.1620	14	-0.2624
15	0.0825	19.5145	0.1914	15	0.0144
16	0.0769	19.9165	0.2240	16	-0.0067
17	0.0795	20.3728	0.2556	17	-0.0223
18	-0.0547	20.6034	0.2999	18	-0.1748
19	-0.0601	20.9010	0.3423	19	0.0579
20	-0.1020	21.8250	0.3501	20	0.1089
21	0.0384	21.9672	0.4014	21	0.0506
22	0.0913	22.8417	0.4107	22	0.0150
23	0.0068	22.8471	0.4697	23	-0.0109
24	-0.0292	22.9564	0.5224	24	-0.0582
25	-0.0427	23.2191	0.5648	25	-0.0708

Time Series Japan 06



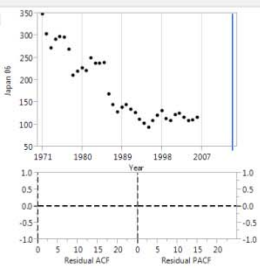
Mean	180.21042
Std	73.714454
N	36
Zero Mean ADF	-2.668021
Single Mean ADF	-2.293239
Trend ADF	-2.100973

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8759	29.9876	<.0001*	1	0.8759
2	0.7683	53.7363	<.0001*	2	0.0045
3	0.6950	73.7587	<.0001*	3	0.0907
4	0.6141	89.8785	<.0001*	4	-0.0598
5	0.5508	103.265	<.0001*	5	0.0427
6	0.4644	113.101	<.0001*	6	-0.1394
7	0.3838	120.048	<.0001*	7	-0.0200
8	0.3540	126.171	<.0001*	8	0.1398
9	0.2962	130.617	<.0001*	9	-0.1176
10	0.2170	133.095	<.0001*	10	-0.1137
11	0.1425	134.206	<.0001*	11	-0.0711
12	0.0434	134.313	<.0001*	12	-0.1700
13	-0.0308	134.370	<.0001*	13	-0.0264
14	-0.1151	135.194	<.0001*	14	-0.1332
15	-0.2170	138.261	<.0001*	15	-0.1153
16	-0.2661	143.104	<.0001*	16	0.0626
17	-0.3021	149.675	<.0001*	17	-0.0095
18	-0.3285	157.874	<.0001*	18	0.0237
19	-0.3640	168.534	<.0001*	19	-0.1195
20	-0.3963	181.963	<.0001*	20	0.0248
21	-0.4079	197.139	<.0001*	21	-0.0144
22	-0.3975	212.576	<.0001*	22	0.0553
23	-0.3831	228.022	<.0001*	23	0.0894
24	-0.3589	242.702	<.0001*	24	0.0487
25	-0.3161	255.129	<.0001*	25	0.0953

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARIMA(1, 2, 2	30	366.42443	306.36200	312.46745	0.906	298.362	0.357237	8.317308	14.610179
☐	☐	ARIMA(2, 2, 2	29	377.94784	308.34584	315.97764	0.906	298.34584	0.132487	8.395540	14.723452
☐	☐	IMA(2, 1)	32	433.62109	308.43574	311.48846	0.891	304.43574	0.126663	9.049383	15.732000
☐	☐	IMA(2, 2)	31	431.49542	308.79868	313.37776	0.897	302.79868	0.105643	8.208898	14.487867
☐	☐	ARIMA(1, 2, 1	31	438.29671	309.36249	313.94157	0.896	303.36249	0.079691	8.396418	14.759660
☐	☐	ARIMA(2, 2, 1	30	425.72144	309.77209	315.87753	0.899	301.77209	0.064933	8.170433	14.451596
☐	☐	ARIMA(1, 1, 1	32	364.48476	310.94638	315.61243	0.923	304.94638	0.036097	8.459275	14.443959
☐	☐	IMA(1, 2)	32	385.07907	311.42589	316.09193	0.923	305.42589	0.028402	9.030443	15.040523
☐	☐	ARIMA(2, 1, 1	31	375.78422	312.93642	319.15781	0.923	304.93642	0.013346	8.521016	14.522400
☐	☐	I(1)	34	436.80596	313.09325	314.64860	0.911	311.09325	0.012339	8.704844	15.079474
☐	☐	IMA(1, 1)	33	426.73701	313.31593	316.42662	0.915	309.31593	0.011039	8.139734	14.227380
☐	☐	ARIMA(2, 1, 2	30	356.51867	313.46336	321.24010	0.926	303.46336	0.010255	8.492378	14.261475
☐	☐	ARI(1, 1)	33	435.15186	313.95115	317.06185	0.914	309.95115	0.008035	8.290538	14.524195
☐	☐	ARI(2, 1)	32	426.63868	314.28206	318.94811	0.917	308.28206	0.006810	8.137381	14.040095
☐	☐	ARIMA(1, 1, 2	31	398.78903	314.79989	321.02129	0.920	306.79989	0.005256	9.117593	15.128869
☐	☐	ARI(2, 2)	31	630.7658	318.78081	323.35989	0.868	312.78081	0.000718	9.817968	16.774050
☐	☐	ARI(1, 2)	32	656.65786	319.07226	322.12499	0.860	315.07226	0.000621	10.481553	17.871635
☐	☐	I(2)	33	694.37874	319.93542	321.46178	0.847	317.93542	0.000403	10.721302	18.408127
☐	☐	ARMA(2, 1)	32	401.01634	327.48852	333.82260	0.842	319.48852	0.000009	8.955086	17.268928
☐	☐	ARMA(1, 1)	33	461.34863	329.16155	333.91211	0.833	323.16155	0.000004	9.057855	17.495022
☐	☐	ARMA(1, 2)	32	444.95117	329.31481	335.64889	0.836	321.31481	0.000004	9.670378	18.344973
☐	☐	ARMA(2, 2)	31	413.87198	329.36498	337.28258	0.842	319.36498	0.000004	8.810447	17.097471
☐	☐	AR(2)	33	472.131	329.93029	334.68084	0.834	323.93029	0.000003	9.211160	17.638058
☐	☐	AR(1)	34	492.16055	330.38184	333.54887	0.831	326.38184	0.000002	9.887176	18.365864
☐	☐	MA(2)	33	1108.1866	360.06205	364.81261	0.707	354.06205	0.000000	16.947881	28.627761
☐	☐	MA(1)	34	1703.7257	375.57738	378.74442	0.607	371.57738	0.000000	22.540134	37.634251
☐	☐	ARIMA(0, 0, 0	35	5589.0727	413.77789	415.36141	0.000	411.77789	0.000000	41.310913	67.331526



Model: ARIMA(1, 2, 2)

Model Summary

DF	30	Stable	Yes
Sum of Squared Errors	10992.7329	Invertible	Yes
Variance Estimate	366.424431		
Standard Deviation	19.1422159		
Akaike's 'A' Information Criterion	306.362003		
Schwarz's Bayesian Criterion	312.467445		
RSquare	0.90631808		
RSquare Adj	0.89694989		
MAPE	8.31730808		
MAE	14.6101788		
-2LogLikelihood	298.362003		

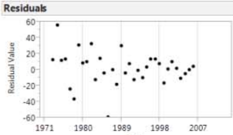
Hessian is not positive definite.

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	-0.5952247	0.142911	-4.16	0.0002*	0.86321185
MA1	1	0.0000037	.	.	.	
MA2	2	0.9999963	4.771186	0.21	0.8354	
Intercept	0	0.5411224	.	.	.	

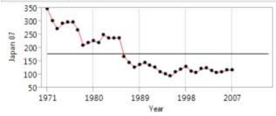
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0358	0.0474	0.8276	1	0.0358
2	0.0159	0.0571	0.9719	2	0.0146
3	-0.2036	1.6940	0.6383	3	-0.2050
4	-0.3778	7.5178	0.1109	4	-0.3795
5	0.0865	7.8334	0.1657	5	0.1151
6	0.0212	7.8531	0.2491	6	0.0036
7	0.0006	7.8531	0.3457	7	-0.1924
8	0.3163	12.5619	0.1278	8	0.2753
9	0.0850	12.9157	0.1665	9	0.2279
10	-0.0260	12.9502	0.2265	10	-0.1675
11	-0.1279	13.8202	0.2431	11	-0.1213
12	-0.3164	19.3884	0.0796	12	0.0080
13	-0.0084	19.3925	0.1114	13	-0.0118
14	-0.0404	19.4922	0.1470	14	-0.2726
15	0.0835	19.9416	0.1742	15	0.0218
16	0.0760	20.3344	0.2055	16	0.0016
17	0.0844	20.8476	0.2332	17	-0.0238
18	-0.0576	21.1011	0.2743	18	-0.1874
19	-0.0601	21.3955	0.3154	19	0.0687
20	-0.1123	22.4990	0.3141	20	0.1054
21	0.0363	22.6232	0.3644	21	0.0391
22	0.0922	23.4912	0.3745	22	0.0132
23	0.0033	23.4924	0.4323	23	-0.0129
24	-0.0250	23.5690	0.4864	24	-0.0611
25	-0.0421	23.8101	0.5304	25	-0.0708

Time Series Japan 07



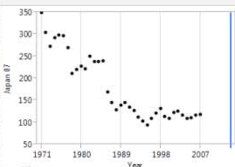
Mean	178.52264
Std	73.41329
N	37
Zero Mean ADF	-2.681682
Single Mean ADF	-2.362479
Trend ADF	-2.057853

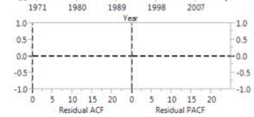
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8778	30.8873	<.0001*	1	0.8778
2	0.7737	55.5649	<.0001*	2	0.0134
3	0.7022	76.4910	<.0001*	3	0.0888
4	0.6200	93.3007	<.0001*	4	-0.0708
5	0.5546	107.169	<.0001*	5	0.0364
6	0.4705	117.473	<.0001*	6	-0.1249
7	0.3954	124.993	<.0001*	7	-0.0040
8	0.3647	131.610	<.0001*	8	0.1228
9	0.3028	136.337	<.0001*	9	-0.1279
10	0.2282	139.121	<.0001*	10	-0.0848
11	0.1591	140.526	<.0001*	11	-0.0688
12	0.0665	140.781	<.0001*	12	-0.1551
13	-0.0086	140.786	<.0001*	13	-0.0444
14	-0.0939	141.339	<.0001*	14	-0.1235
15	-0.1987	143.928	<.0001*	15	-0.1455
16	-0.2487	148.180	<.0001*	16	0.0713
17	-0.2867	154.108	<.0001*	17	-0.0033
18	-0.3096	161.389	<.0001*	18	0.0564
19	-0.3407	170.692	<.0001*	19	-0.1088
20	-0.3768	182.745	<.0001*	20	-0.0159
21	-0.3950	196.814	<.0001*	21	-0.0355
22	-0.4061	212.681	<.0001*	22	-0.0207
23	-0.3917	228.492	<.0001*	23	0.1693
24	-0.3677	243.501	<.0001*	24	0.0328
25	-0.3292	256.530	<.0001*	25	0.1133

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARIMA(1, 2, 2	31	354.92829	314.04751	320.26890	0.908	306.04751	0.368600	8.160113	14.291006
☐	☐	ARIMA(2, 2, 2	30	365.55883	316.02667	323.80341	0.908	306.02667	0.137021	8.239385	14.406459
☐	☐	IMA(2, 1)	33	420.53179	316.30285	319.41355	0.893	312.30285	0.119348	8.819233	15.319488
☐	☐	IMA(2, 2)	32	418.18915	316.64097	321.30702	0.899	310.64097	0.100784	8.025688	14.142032
☐	☐	ARIMA(1, 2, 1	32	424.72497	317.21820	321.88424	0.898	311.2182	0.075518	8.215320	14.415843
☐	☐	ARIMA(2, 2, 1	31	412.00343	317.55995	323.78134	0.901	309.55995	0.063656	7.980250	14.094588
☐	☐	ARIMA(1, 1, 1	33	353.9515	318.66590	323.41645	0.925	312.6659	0.036617	8.320657	14.155452
☐	☐	IMA(1, 2)	33	374.47167	319.25941	324.00997	0.924	313.25941	0.027215	8.952127	14.848305
☐	☐	ARIMA(1, 1, 2	32	364.54728	320.65635	326.99043	0.925	312.65635	0.013535	8.390713	14.243503
☐	☐	ARIMA(2, 1, 1	32	364.66174	320.65868	326.99276	0.925	312.65868	0.013519	8.373409	14.222167
☐	☐	I(1)	35	426.13201	321.12039	322.70391	0.912	319.12039	0.010732	8.643765	14.859704
☐	☐	IMA(1, 1)	34	414.92982	321.20452	324.37156	0.916	317.20452	0.010290	8.014950	13.944936
☐	☐	ARIMA(2, 1, 2	31	364.31068	321.66274	329.58034	0.927	311.66274	0.008183	8.600830	14.281504
☐	☐	ARI(1, 1)	34	423.28188	321.87280	325.03984	0.915	317.8728	0.007367	8.182696	14.258645
☐	☐	ARI(2, 1)	33	415.20172	322.20098	326.95153	0.919	316.20098	0.006252	8.047399	13.811154
☐	☐	ARI(2, 2)	32	611.16609	326.96747	331.63351	0.870	320.96747	0.000577	9.598682	16.377278
☐	☐	ARI(1, 2)	33	637.59369	327.36852	330.47922	0.862	323.36852	0.000472	10.321015	17.520180
☐	☐	I(2)	34	675.07228	328.32983	329.88517	0.850	326.32983	0.000292	10.561874	18.045345
☐	☐	ARMA(2, 1)	33	388.77249	335.24143	341.68510	0.844	327.24143	0.000009	8.779795	16.899205
☐	☐	ARMA(1, 1)	34	447.65965	337.05652	341.88928	0.835	331.05652	0.000004	8.879065	17.115753
☐	☐	ARMA(2, 2)	32	400.85226	337.12277	345.17736	0.844	327.12277	0.000004	8.647398	16.744492
☐	☐	AR(2)	34	458.10752	337.84715	342.67990	0.836	331.84715	0.000003	9.033609	17.261659
☐	☐	AR(1)	35	477.80673	338.34859	341.57043	0.834	334.34859	0.000002	9.633802	17.888392
☐	☐	ARMA(1, 2)	33	417.54973	341.13804	347.58172	0.811	333.13804	0.000000	11.435218	21.157001
☐	☐	MA(2)	34	1087.5582	369.22603	374.05878	0.708	363.22603	0.000000	16.787933	28.302568
☐	☐	MA(1)	35	1685.51	385.48642	388.70826	0.607	381.48642	0.000000	22.425717	37.397222
☐	☐	ARIMA(0, 0, 0	36	5539.2198	424.91322	426.52414	0.000	422.91322	0.000000	41.060560	66.880231





Model: ARIMA(1, 2, 2)

Model Summary

DF	31	Stable	Yes
Sum of Squared Errors	11002.777	Invertible	Yes
Variance Estimate	354.92829		
Standard Deviation	18.8395406		
Akaike's 'A' Information Criterion	314.047506		
Schwarz's Bayesian Criterion	320.268899		
RSquare	0.90797324		
RSquare Adj	0.89906742		
MAPE	8.16011347		
MAE	14.2910056		
-2LogLikelihood	306.047506		

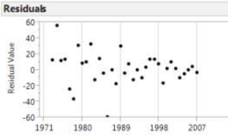
Failed: Cannot Decrease Objective Function Hessian is not positive definite.

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	-0.5959631	0.142194	-4.19	0.0002*	0.83387544
MA1	1	-3.4244e-7	.	.	.	
MA2	2	0.9999996	.	.	.	
Intercept	0	0.5224904	1.768024	0.30	0.7696	

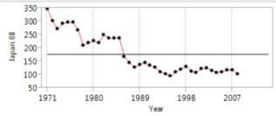
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0342	0.0446	0.8327	1	0.0342
2	0.0150	0.0534	0.9736	2	0.0138
3	-0.2021	1.7067	0.6355	3	-0.2034
4	-0.3742	7.5571	0.1092	4	-0.3762
5	0.0856	7.8732	0.1634	5	0.1121
6	0.0176	7.8870	0.2465	6	-0.0015
7	0.0000	7.8870	0.3427	7	-0.1888
8	0.3224	12.8728	0.1163	8	0.2836
9	0.0826	13.2129	0.1532	9	0.2184
10	-0.0309	13.2622	0.2094	10	-0.1740
11	-0.1328	14.2145	0.2214	11	-0.1165
12	-0.3177	19.8968	0.0691	12	0.0041
13	-0.0049	19.8982	0.0978	13	-0.0230
14	-0.0398	19.9959	0.1303	14	-0.2678
15	0.0884	20.5023	0.1535	15	0.0371
16	0.0740	20.8759	0.1833	16	-0.0161
17	0.0865	21.4145	0.2083	17	-0.0273
18	-0.0681	21.7674	0.2425	18	-0.1807
19	-0.0533	21.9974	0.2844	19	0.0863
20	-0.1118	23.0759	0.2851	20	0.0885
21	0.0591	23.3985	0.3231	21	0.0687
22	0.0957	24.3115	0.3311	22	0.0341
23	0.0001	24.3115	0.3867	23	-0.0256
24	-0.0184	24.3514	0.4417	24	-0.0526
25	-0.0519	24.7006	0.4792	25	-0.0596

Time Series Japan 08



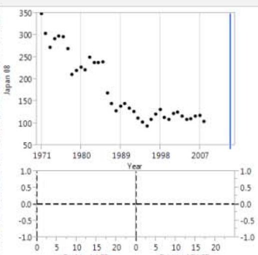
Mean	176.54548
Std	73.432423
N	38
Zero Mean ADF	-2.771946
Single Mean ADF	-2.299455
Trend ADF	-2.247406

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8749	31.4459	<.0001*	1	0.8749
2	0.7734	56.7032	<.0001*	2	0.0340
3	0.7058	78.3393	<.0001*	3	0.0957
4	0.6261	95.8661	<.0001*	4	-0.0671
5	0.5591	110.264	<.0001*	5	0.0184
6	0.4733	120.906	<.0001*	6	-0.1246
7	0.4012	128.799	<.0001*	7	0.0063
8	0.3766	135.984	<.0001*	8	0.1399
9	0.3145	141.169	<.0001*	9	-0.1366
10	0.2357	144.185	<.0001*	10	-0.1041
11	0.1721	145.853	<.0001*	11	-0.0383
12	0.0864	146.289	<.0001*	12	-0.1477
13	0.0188	146.311	<.0001*	13	-0.0262
14	-0.0670	146.595	<.0001*	14	-0.1389
15	-0.1721	148.553	<.0001*	15	-0.1408
16	-0.2259	152.077	<.0001*	16	0.0325
17	-0.2648	157.152	<.0001*	17	0.0125
18	-0.2901	163.548	<.0001*	18	0.0615
19	-0.3171	171.590	<.0001*	19	-0.0668
20	-0.3479	181.811	<.0001*	20	-0.0151
21	-0.3707	194.099	<.0001*	21	-0.0755
22	-0.3895	208.509	<.0001*	22	-0.0451
23	-0.4004	224.753	<.0001*	23	0.0728
24	-0.3766	240.149	<.0001*	24	0.1287
25	-0.3389	253.574	<.0001*	25	0.0948

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARIMA(1, 2, 2	32	350.17928	322.34125	328.67533	0.909	314.34125	0.368334	8.427385	14.434077
☐	☐	ARIMA(2, 2, 2	31	360.0957	324.31278	332.23038	0.909	314.31278	0.137445	8.489908	14.524929
☐	☐	IMA(2, 1)	34	416.27204	324.84491	328.01195	0.895	320.84491	0.105337	8.962601	15.331208
☐	☐	IMA(2, 2)	33	413.59461	325.14391	329.89447	0.900	319.14391	0.090709	8.223109	14.223232
☐	☐	ARIMA(1, 2, 1	33	420.27234	325.76073	330.51128	0.898	319.76073	0.066637	8.375447	14.454163
☐	☐	ARIMA(2, 2, 1	32	405.98193	325.94796	332.28204	0.902	317.94796	0.060681	8.165329	14.157773
☐	☐	ARIMA(1, 1, 1	34	345.09564	326.46791	331.30067	0.927	320.46791	0.046790	8.328410	14.021121
☐	☐	IMA(1, 2)	34	363.34393	326.95409	331.78684	0.926	320.95409	0.036693	8.816399	14.557541
☐	☐	ARIMA(1, 1, 2	33	354.86083	328.44861	334.89229	0.927	320.44861	0.017380	8.419750	14.136948
☐	☐	ARIMA(2, 1, 1	33	355.05593	328.45399	334.89766	0.927	320.45399	0.017333	8.394201	14.105333
☐	☐	I(1)	36	416.01703	329.12456	330.73548	0.914	327.12456	0.012396	8.622058	14.691317
☐	☐	IMA(1, 1)	35	405.467	329.21721	332.43904	0.918	325.21721	0.011834	8.078317	13.872679
☐	☐	ARIMA(2, 1, 2	32	353.18166	329.30695	337.36154	0.929	319.30695	0.011315	8.495506	14.023327
☐	☐	ARI(1, 1)	35	413.61905	329.90413	333.12596	0.917	325.90413	0.008394	8.211950	14.142871
☐	☐	ARI(2, 1)	34	404.32003	330.09305	334.92580	0.921	324.09305	0.007638	8.036517	13.660848
☐	☐	ARI(2, 2)	33	602.20093	335.69391	340.44446	0.872	329.69391	0.000464	9.815542	16.472252
☐	☐	ARI(1, 2)	34	628.9836	336.17364	339.34067	0.864	332.17364	0.000365	10.540353	17.539852
☐	☐	I(2)	35	663.94443	337.08457	338.66809	0.852	335.08457	0.000232	10.710074	17.981448
☐	☐	ARMA(2, 1)	34	382.35809	343.55720	350.10754	0.841	335.5572	0.000009	8.927072	16.950985
☐	☐	ARMA(1, 2)	34	422.52914	345.44661	351.99696	0.835	337.44661	0.000004	9.684363	18.066306
☐	☐	ARMA(2, 2)	33	393.96281	345.45929	353.64722	0.840	335.45929	0.000004	8.801871	16.808370
☐	☐	ARMA(1, 1)	35	441.63609	345.59330	350.50606	0.831	339.5933	0.000003	9.065275	17.205680
☐	☐	AR(2)	35	452.29632	346.43667	351.34943	0.832	340.43667	0.000002	9.242670	17.380224
☐	☐	AR(1)	36	470.72334	346.89085	350.16603	0.831	342.89085	0.000002	9.800489	17.951545
☐	☐	MA(2)	35	1091.6536	379.22173	384.13449	0.706	373.22173	0.000000	17.020488	28.380601
☐	☐	MA(1)	36	1692.0485	395.92872	399.20390	0.606	391.92872	0.000000	22.610309	37.409877
☐	☐	ARIMA(0, 0, 0	37	5538.0591	436.36311	438.00070	0.000	434.36311	0.000000	41.195216	66.681140



Model: ARIMA(1, 2, 2)

Model Summary

DF	32	Stable	Yes
Sum of Squared Errors	11205.737	Invertible	Yes
Variance Estimate	350.179281		
Standard Deviation	18.7130778		
Akaike's 'A' Information Criterion	322.341252		
Schwarz's Bayesian Criterion	328.675328		
RSquare	0.90909138		
RSquare Adj	0.9005687		
MAPE	8.42738526		
MAE	14.4340774		
-2LogLikelihood	314.341252		

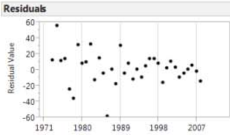
Failed: Cannot Decrease Objective Function Hessian is not positive definite.

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	-0.5902874	0.0000000	.	.	0.70520798
MA1	1	3.10411e-7	0.0301757	0.00	1.0000	
MA2	2	0.9999995	0.0000000	.	.	
Intercept	0	0.4434469	0.0000000	.	.	

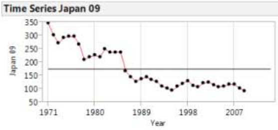
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0289	0.0327	0.8564	1	0.0289
2	0.0097	0.0365	0.9819	2	0.0088
3	-0.2020	1.7279	0.6307	3	-0.2027
4	-0.3630	7.3607	0.1180	4	-0.3665
5	0.0956	7.7640	0.1697	5	0.1160
6	0.0139	7.7728	0.2552	6	-0.0118
7	-0.0134	7.7813	0.3523	7	-0.1979
8	0.3145	12.6127	0.1259	8	0.2861
9	0.0997	13.1164	0.1574	9	0.2429
10	-0.0380	13.1923	0.2131	10	-0.1964
11	-0.1456	14.3527	0.2141	11	-0.1486
12	-0.3283	20.4955	0.0583	12	0.0109
13	-0.0084	20.4996	0.0834	13	-0.0201
14	-0.0284	20.5498	0.1137	14	-0.3024
15	0.0881	21.0558	0.1351	15	0.0327
16	0.0874	21.5785	0.1573	16	0.0530
17	0.0780	22.0170	0.1841	17	-0.0703
18	-0.0607	22.2967	0.2191	18	-0.2196
19	-0.0864	22.8980	0.2419	19	0.0998
20	-0.0884	23.5666	0.2618	20	0.1948
21	0.0593	23.8872	0.2986	21	0.0101
22	0.1670	26.6138	0.2263	22	0.0808
23	0.0115	26.6276	0.2721	23	0.0556
24	-0.0284	26.7193	0.3177	24	-0.0795
25	-0.0291	26.8245	0.3647	25	-0.0541

Time Series Japan 09



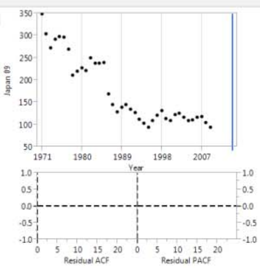
Mean	174.42079
Std	73.658667
N	39
Zero Mean ADF	-2.841122
Single Mean ADF	-2.265026
Trend ADF	-2.350652

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8742	32.1542	<.0001*	1	0.8742
2	0.7697	57.7572	<.0001*	2	0.0236
3	0.7044	79.7972	<.0001*	3	0.1139
4	0.6291	97.8782	<.0001*	4	-0.0565
5	0.5644	112.859	<.0001*	5	0.0198
6	0.4777	123.918	<.0001*	6	-0.1368
7	0.4039	132.070	<.0001*	7	0.0022
8	0.3817	139.585	<.0001*	8	0.1487
9	0.3270	145.286	<.0001*	9	-0.1140
10	0.2486	148.693	<.0001*	10	-0.1144
11	0.1804	150.552	<.0001*	11	-0.0570
12	0.1010	151.156	<.0001*	12	-0.1147
13	0.0403	151.256	<.0001*	13	-0.0201
14	-0.0370	151.343	<.0001*	14	-0.1175
15	-0.1418	152.682	<.0001*	15	-0.1547
16	-0.1965	155.367	<.0001*	16	0.0377
17	-0.2394	159.533	<.0001*	17	-0.0318
18	-0.2660	164.920	<.0001*	18	0.0709
19	-0.2954	171.897	<.0001*	19	-0.0603
20	-0.3220	180.620	<.0001*	20	0.0280
21	-0.3394	190.851	<.0001*	21	-0.0647
22	-0.3630	203.246	<.0001*	22	-0.0875
23	-0.3819	217.822	<.0001*	23	0.0407
24	-0.3855	233.665	<.0001*	24	0.0224
25	-0.3484	247.529	<.0001*	25	0.1847

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARIMA(1, 2, 2	33	340.86191	330.10368	336.54735	0.912	322.10368	0.378495	8.440159	14.289774
☐	☐	ARIMA(2, 2, 2	32	350.49526	332.08457	340.13916	0.912	322.08457	0.140577	8.486708	14.353717
☐	☐	IMA(2, 1)	35	407.77518	332.97917	336.20101	0.897	328.97917	0.089878	9.011671	15.215009
☐	☐	IMA(2, 2)	34	402.86902	333.05479	337.88754	0.903	327.05479	0.086543	8.209945	14.055892
☐	☐	ARIMA(1, 2, 1	34	410.05767	333.74177	338.57453	0.901	327.74177	0.061384	8.309768	14.211122
☐	☐	ARIMA(2, 2, 1	33	395.46165	333.84811	340.29178	0.905	325.84811	0.058206	8.145584	13.970592
☐	☐	ARIMA(1, 1, 1	35	335.21868	334.07599	338.98875	0.929	328.07599	0.051938	8.118144	13.661333
☐	☐	IMA(1, 2)	35	352.85434	334.59130	339.50406	0.928	328.5913	0.040141	8.609973	14.201873
☐	☐	ARIMA(1, 1, 2	34	344.39571	336.05517	342.60552	0.929	328.05517	0.019307	8.214253	13.781748
☐	☐	ARIMA(2, 1, 1	34	344.58907	336.06097	342.61132	0.929	328.06097	0.019251	8.187440	13.748927
☐	☐	ARIMA(2, 1, 2	33	342.63778	336.89008	345.07801	0.931	326.89008	0.012718	8.319495	13.700065
☐	☐	I(1)	37	405.02665	336.97614	338.61373	0.917	334.97614	0.012182	8.481220	14.390648
☐	☐	IMA(1, 1)	36	394.20156	336.99130	340.26647	0.921	332.9913	0.012090	7.873762	13.515532
☐	☐	ARI(1, 1)	36	402.1793	337.70308	340.97825	0.920	333.70308	0.008470	8.031835	13.804742
☐	☐	ARI(2, 1)	35	392.76887	337.83541	342.74817	0.923	331.83541	0.007927	7.832947	13.308837
☐	☐	ARI(2, 2)	34	584.88144	343.85379	348.68655	0.876	337.85379	0.000391	9.641679	16.115777
☐	☐	ARI(1, 2)	35	611.03552	344.38586	347.60770	0.868	340.38586	0.000300	10.278392	17.086395
☐	☐	I(2)	36	645.89642	345.40134	347.01226	0.857	343.40134	0.000180	10.530809	17.601564
☐	☐	ARMA(2, 1)	35	372.13538	351.39364	358.04789	0.842	343.39364	0.000009	8.894018	16.755140
☐	☐	ARMA(2, 2)	34	383.02756	353.27936	361.59716	0.842	343.27936	0.000004	8.750451	16.596821
☐	☐	ARMA(1, 2)	35	411.27796	353.33923	359.99348	0.837	345.33923	0.000003	9.626313	17.830404
☐	☐	ARMA(1, 1)	36	429.94195	353.54773	358.53841	0.833	347.54773	0.000003	9.037075	17.028561
☐	☐	AR(2)	36	440.80871	354.46511	359.45580	0.833	348.46511	0.000002	9.214733	17.181533
☐	☐	AR(1)	37	460.67975	355.13016	358.45728	0.831	351.13016	0.000001	9.873803	17.866341
☐	☐	MA(2)	36	1073.7713	388.46254	393.45323	0.710	382.46254	0.000000	17.055344	28.168015
☐	☐	MA(1)	37	1690.515	406.19173	409.51885	0.608	402.19173	0.000000	22.823516	37.359343
☐	☐	ARIMA(0, 0, 0	38	5568.3782	448.03367	449.69723	0.000	446.03367	0.000000	41.618805	66.605741



Model: ARIMA(1, 2, 2)

Model Summary

DF	33	Stable	Yes
Sum of Squared Errors	11248.4432	Invertible	Yes
Variance Estimate	340.861915		
Standard Deviation	18.4624461		
Akaike's 'A' Information Criterion	330.103678		
Schwarz's Bayesian Criterion	336.547349		
RSquare	0.91181121		
RSquare Adj	0.90379405		
MAPE	8.44015859		
MAE	14.2897738		
-2LogLikelihood	322.103678		

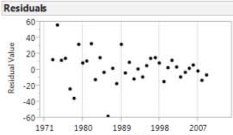
Hessian is not positive definite.

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	-0.5858029	0.0982411	-5.96	<.0001*	0.64633112
MA1	1	8.56622e-7	.	.	.	
MA2	2	0.9999991	0.2711173	3.69	0.0008*	
Intercept	0	0.4075734	.	.	.	

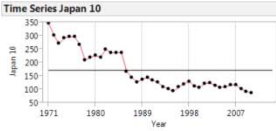
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0324	0.0422	0.8373	1	0.0324
2	0.0123	0.0484	0.9761	2	0.0112
3	-0.2056	1.8429	0.6056	3	-0.2066
4	-0.3618	7.5682	0.1087	4	-0.3643
5	0.0976	7.9977	0.1564	5	0.1230
6	0.0195	8.0153	0.2370	6	-0.0043
7	-0.0156	8.0270	0.3302	7	-0.2045
8	0.3061	12.6905	0.1230	8	0.2820
9	0.0969	13.1739	0.1549	9	0.2463
10	-0.0272	13.2134	0.2120	10	-0.1890
11	-0.1486	14.4390	0.2096	11	-0.1655
12	-0.3354	20.9314	0.0514	12	0.0004
13	-0.0157	20.9462	0.0740	13	-0.0104
14	-0.0320	21.0104	0.1014	14	-0.3093
15	0.0944	21.5953	0.1189	15	0.0149
16	0.0861	22.1052	0.1398	16	0.0643
17	0.0864	22.6433	0.1612	17	-0.0361
18	-0.0650	22.9644	0.1920	18	-0.2524
19	-0.0817	23.4998	0.2160	19	0.0882
20	-0.1070	24.4715	0.2224	20	0.2176
21	0.0706	24.9212	0.2506	21	0.0470
22	0.1661	27.5769	0.1901	22	0.0314
23	0.0501	27.8352	0.2221	23	0.0974
24	-0.0223	27.8904	0.2647	24	-0.0198
25	-0.0349	28.0366	0.3062	25	-0.0891

Time Series Japan 10



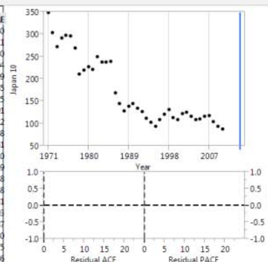
Mean	172.25481
Std	73.979227
N	40
Zero Mean ADF	-2.89458
Single Mean ADF	-2.262872
Trend ADF	-2.409837

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8751	32.9915	<.0001*	1	0.8751
2	0.7698	59.1936	<.0001*	2	0.0170
3	0.7008	81.4922	<.0001*	3	0.1010
4	0.6279	99.8929	<.0001*	4	-0.0359
5	0.5672	115.335	<.0001*	5	0.0279
6	0.4836	126.891	<.0001*	6	-0.1309
7	0.4089	135.402	<.0001*	7	-0.0118
8	0.3839	143.140	<.0001*	8	0.1429
9	0.3326	149.135	<.0001*	9	-0.1011
10	0.2622	152.984	<.0001*	10	-0.0924
11	0.1941	155.167	<.0001*	11	-0.0670
12	0.1104	155.897	<.0001*	12	-0.1299
13	0.0554	156.088	<.0001*	13	0.0114
14	-0.0146	156.102	<.0001*	14	-0.1125
15	-0.1100	156.914	<.0001*	15	-0.1318
16	-0.1653	158.827	<.0001*	16	0.0232
17	-0.2093	162.027	<.0001*	17	-0.0251
18	-0.2401	166.431	<.0001*	18	0.0215
19	-0.2709	172.300	<.0001*	19	-0.0505
20	-0.3000	179.859	<.0001*	20	0.0322
21	-0.3134	188.544	<.0001*	21	-0.0179
22	-0.3315	198.802	<.0001*	22	-0.0766
23	-0.3552	211.273	<.0001*	23	-0.0061
24	-0.3671	225.424	<.0001*	24	-0.0056
25	-0.3582	239.793	<.0001*	25	0.0732

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARIMA(1, 2, 2	34	332.09023	337.83981	344.39016	0.915	329.83981	0.382291	8.426388	14.110140
☐	☐	ARIMA(2, 2, 2	33	341.42055	339.82767	348.01560	0.915	329.82767	0.141494	8.467542	14.164211
☐	☐	IMA(2, 2)	35	392.08787	340.88928	345.80204	0.906	334.88928	0.083217	8.149420	13.839130
☐	☐	IMA(2, 1)	36	397.64858	340.89958	344.17475	0.901	336.89958	0.082790	8.943978	14.976104
☐	☐	ARIMA(1, 2, 1	35	399.06	341.58675	346.49951	0.905	335.58675	0.058716	8.190479	13.924109
☐	☐	ARIMA(1, 1, 1	36	325.90534	341.65828	346.64897	0.931	335.65828	0.056653	7.931403	13.331185
☐	☐	ARIMA(2, 2, 1	34	385.8951	341.74158	348.29192	0.908	333.74158	0.054342	8.167603	13.835525
☐	☐	IMA(1, 2)	36	342.95712	342.20672	347.19741	0.931	336.20672	0.043066	8.436780	13.881791
☐	☐	ARIMA(1, 1, 2	35	334.56167	343.63653	350.29078	0.931	335.63653	0.021069	8.031425	13.454512
☐	☐	ARIMA(2, 1, 1	35	334.74417	343.64252	350.29676	0.931	335.64252	0.021007	8.003496	13.420968
☐	☐	ARIMA(2, 1, 2	34	332.54239	344.43465	352.75246	0.933	334.43465	0.014137	8.115722	13.358351
☐	☐	IMA(1, 1)	37	383.57383	344.74197	348.06910	0.924	340.74197	0.012123	7.699033	13.190610
☐	☐	I(1)	38	394.38389	344.77983	346.44339	0.920	342.77983	0.011896	8.286384	14.040259
☐	☐	ARI(1, 1)	37	391.37456	345.47710	348.80422	0.922	341.4771	0.008394	7.872361	13.490748
☐	☐	ARI(2, 1)	36	381.86564	345.55200	350.54268	0.926	339.552	0.008086	7.648096	12.982058
☐	☐	ARI(2, 2)	35	568.1604	351.96518	356.87794	0.881	345.96518	0.000327	9.394474	15.698731
☐	☐	ARI(1, 2)	36	594.5016	352.59772	355.87290	0.873	348.59772	0.000239	10.124880	16.741293
☐	☐	I(2)	37	628.65535	353.68210	355.31968	0.862	351.6821	0.000139	10.337175	17.213687
☐	☐	ARMA(2, 1)	36	362.8736	359.25128	366.00679	0.844	351.25128	0.000009	8.895436	16.585830
☐	☐	ARMA(1, 1)	37	418.92237	361.47894	366.54557	0.835	355.47894	0.000003	8.990413	16.795975
☐	☐	AR(2)	37	429.15776	362.38317	367.44981	0.836	356.38317	0.000002	9.133123	16.915286
☐	☐	AR(1)	38	449.41534	363.18020	366.55796	0.833	359.1802	0.000001	9.852048	17.664274
☐	☐	ARMA(1, 2)	36	385.34791	364.86584	371.62135	0.820	356.86584	0.000001	11.103090	20.168777
☐	☐	ARMA(2, 2)	35	396.28241	366.85403	375.29843	0.819	356.85403	0.000000	11.087724	20.127696
☐	☐	MA(2)	37	1081.2775	398.50982	403.57646	0.711	392.50982	0.000000	17.385955	28.207668
☐	☐	MA(1)	38	1705.2723	416.83608	420.21384	0.608	412.83608	0.000000	23.238708	37.457616
☐	☐	ARIMA(0, 0, 0	39	5613.2575	459.81783	461.50671	0.000	457.81783	0.000000	42.200793	66.565081



Model: ARIMA(1, 2, 2)

Model Summary

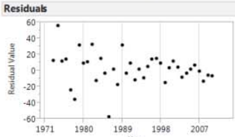
DF	34	Stable	Yes
Sum of Squared Errors	11291.0679	Invertible	No
Variance Estimate	332.090232		
Standard Deviation	18.2233431		
Akaike's 'A' Information Criterion	337.839815		
Schwarz's Bayesian Criterion	344.390159		
RSquare	0.91466459		
RSquare Adj	0.90713499		
MAPE	8.42638783		
MAE	14.1101402		
-2LogLikelihood	329.839815		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	-0.585294	0.1373997	-4.26	0.0002*	0.5944029
MA1	1	0.000000	0.1296558	0.00	1.0000	
MA2	2	1.000000	0.1296547	7.71	<.0001*	
Intercept	0	0.374948	0.3066118	1.22	0.2298	

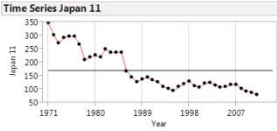
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0345	0.0489	0.8250	1	0.0345
2	0.0201	0.0659	0.9676	2	0.0189
3	-0.2047	1.8863	0.5963	3	-0.2064
4	-0.3648	7.8344	0.0978	4	-0.3666
5	0.0959	8.2582	0.1426	5	0.1279
6	0.0214	8.2800	0.2183	6	0.0061
7	-0.0100	8.2849	0.3081	7	-0.2021
8	0.3036	12.9539	0.1134	8	0.2775
9	0.0897	13.3757	0.1463	9	0.2424
10	-0.0286	13.4199	0.2011	10	-0.1937
11	-0.1380	14.4917	0.2070	11	-0.1542
12	-0.3388	21.2004	0.0475*	12	-0.0072
13	-0.0241	21.2357	0.0684	13	-0.0271
14	-0.0404	21.3391	0.0933	14	-0.3039
15	0.0912	21.8885	0.1108	15	0.0203
16	0.0919	22.4718	0.1286	16	0.0481
17	0.0860	23.0075	0.1490	17	-0.0398
18	-0.0566	23.2512	0.1811	18	-0.2121
19	-0.0858	23.8400	0.2024	19	0.0673
20	-0.1031	24.7376	0.2117	20	0.1844
21	0.0517	24.9763	0.2482	21	0.0505
22	0.1770	27.9521	0.1773	22	0.0946
23	0.0500	28.2052	0.2081	23	0.0645
24	0.0158	28.2324	0.2504	24	-0.0043
25	-0.0291	28.3313	0.2928	25	-0.0340

Time Series Japan 11



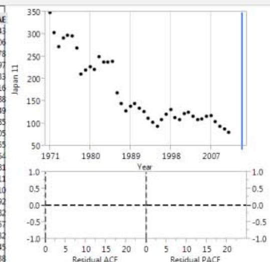
Mean	169.9973
Std	74.453308
N	41
Zero Mean ADF	-2.954589
Single Mean ADF	-2.233692
Trend ADF	-2.483613

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8756	33.7908	<.0001*	1	0.8756
2	0.7713	60.6825	<.0001*	2	0.0198
3	0.7006	83.4539	<.0001*	3	0.0913
4	0.6240	102.009	<.0001*	4	-0.0465
5	0.5654	117.664	<.0001*	5	0.0468
6	0.4867	129.597	<.0001*	6	-0.1172
7	0.4152	138.534	<.0001*	7	-0.0095
8	0.3882	146.585	<.0001*	8	0.1255
9	0.3350	152.769	<.0001*	9	-0.1013
10	0.2686	156.872	<.0001*	10	-0.0772
11	0.2086	159.430	<.0001*	11	-0.0447
12	0.1254	160.386	<.0001*	12	-0.1428
13	0.0653	160.655	<.0001*	13	-0.0072
14	0.0017	160.655	<.0001*	14	-0.0743
15	-0.0853	161.149	<.0001*	15	-0.1242
16	-0.1319	162.376	<.0001*	16	0.0422
17	-0.1766	164.668	<.0001*	17	-0.0447
18	-0.2088	168.011	<.0001*	18	0.0271
19	-0.2439	172.778	<.0001*	19	-0.0905
20	-0.2744	179.101	<.0001*	20	0.0390
21	-0.2909	186.559	<.0001*	21	-0.0165
22	-0.3048	195.180	<.0001*	22	-0.0325
23	-0.3227	205.379	<.0001*	23	0.0048
24	-0.3397	217.348	<.0001*	24	-0.0515
25	-0.3397	230.066	<.0001*	25	0.0431

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARIMA(1, 2, 2	35	323.571	345.52694	352.18118	0.918	337.52694	0.391147	8.404398	13.918243
☐	☐	ARIMA(2, 2, 2	34	332.39345	347.51463	355.83244	0.918	337.51463	0.144783	8.445529	13.971706
☐	☐	IMA(2, 2)	36	382.68754	348.77822	353.76890	0.910	342.77822	0.076972	8.173466	13.694978
☐	☐	IMA(2, 1)	37	388.79025	348.87103	352.19815	0.904	344.87103	0.073482	8.931998	14.776697
☐	☐	ARIMA(1, 1, 1	37	317.08423	349.21318	354.27982	0.934	343.21318	0.061927	7.740273	13.004533
☐	☐	ARIMA(1, 2, 1	36	389.54283	349.49633	354.48702	0.908	343.49633	0.053752	8.174923	13.730316
☐	☐	ARIMA(2, 2, 1	35	377.4144	349.68313	356.33737	0.911	341.68313	0.048959	8.239860	13.736488
☐	☐	IMA(1, 2)	37	333.62914	349.79270	354.85934	0.933	343.7927	0.046349	8.259118	13.562749
☐	☐	ARIMA(1, 1, 2	36	325.24164	351.18958	357.94510	0.934	343.18958	0.023052	7.839512	13.127285
☐	☐	ARIMA(2, 1, 1	36	325.42331	351.19608	357.95160	0.934	343.19608	0.022977	7.811548	13.093705
☐	☐	ARIMA(2, 1, 2	35	323.04487	351.95437	360.39876	0.936	341.95437	0.015727	7.932417	13.040855
☐	☐	IMA(1, 1)	38	373.53674	352.47032	355.84808	0.927	348.47032	0.012151	7.559105	12.906154
☐	☐	I(1)	39	384.32177	352.56158	354.25046	0.923	350.56158	0.011609	8.123158	13.726481
☐	☐	ARI(1, 1)	38	381.1239	353.22445	356.60221	0.925	349.22445	0.008334	7.717314	13.187511
☐	☐	ARI(2, 1)	37	371.70826	353.25930	358.32593	0.929	347.2593	0.008190	7.534692	12.720610
☐	☐	ARI(2, 2)	36	552.37437	360.05072	365.04140	0.885	354.05072	0.000274	9.171927	15.313892
☐	☐	ARI(1, 2)	37	578.57202	360.76581	364.09293	0.878	356.76581	0.000192	9.940396	16.371282
☐	☐	I(2)	38	612.37501	361.94061	363.60417	0.867	359.94061	0.000107	10.175018	16.852357
☐	☐	ARMA(2, 1)	37	353.77273	367.04792	373.90221	0.846	359.04792	0.000008	8.890657	16.401932
☐	☐	ARMA(1, 2)	37	391.74751	369.23918	376.09347	0.840	361.23918	0.000003	9.688635	17.543245
☐	☐	ARMA(1, 1)	38	409.17253	369.47491	374.61563	0.837	363.47491	0.000002	9.032343	16.658638
☐	☐	AR(2)	38	419.12171	370.39764	375.53836	0.838	364.39764	0.000002	9.161728	16.754729
☐	☐	AR(1)	39	439.57126	371.29975	374.72690	0.835	367.29975	0.000001	9.919641	17.540593
☐	☐	ARMA(2, 2)	36	404.02738	371.88522	380.45308	0.850	361.88522	0.000001	8.714364	16.217443
☐	☐	MA(2)	38	1072.2719	408.10543	413.24614	0.715	402.10543	0.000000	17.737682	28.248744
☐	☐	MA(1)	39	1716.645	427.41340	430.84054	0.610	423.4134	0.000000	23.709963	37.499675
☐	☐	ARIMA(0, 0, 0	40	5681.8774	471.78708	473.50065	0.000	469.78708	0.000000	43.075819	66.593382



Model: ARIMA(1, 2, 2)

Model Summary

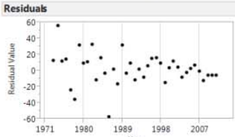
DF	35	Stable	Yes
Sum of Squared Errors	11324.985	Invertible	No
Variance Estimate	323.571		
Standard Deviation	17.9880794		
Akaike's 'A' Information Criterion	345.526936		
Schwarz's Bayesian Criterion	352.181182		
RSquare	0.91782344		
RSquare Adj	0.91077974		
MAPE	8.40439839		
MAE	13.9182434		
-2LogLikelihood	337.526936		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	-0.583030	0.1356173	-4.30	0.0001*	0.54823257
MA1	1	0.000000	0.1200184	0.00	1.0000	
MA2	2	1.000000	0.1200178	8.33	<.0001*	
Intercept	0	0.346319	0.2920514	1.19	0.2437	

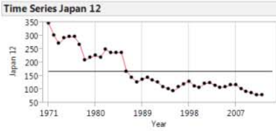
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0348	0.0509	0.8215	1	0.0348
2	0.0237	0.0752	0.9631	2	0.0225
3	-0.1973	1.8050	0.6139	3	-0.1993
4	-0.3628	7.8195	0.0984	4	-0.3641
5	0.0920	8.2174	0.1447	5	0.1257
6	0.0200	8.2367	0.2213	6	0.0103
7	-0.0085	8.2403	0.3119	7	-0.1927
8	0.3078	13.1277	0.1075	8	0.2787
9	0.0873	13.5342	0.1399	9	0.2321
10	-0.0346	13.6001	0.1920	10	-0.1946
11	-0.1386	14.6974	0.1968	11	-0.1500
12	-0.3283	21.0817	0.0492*	12	-0.0017
13	-0.0276	21.1284	0.0704	13	-0.0391
14	-0.0486	21.2796	0.0947	14	-0.3078
15	0.0832	21.7411	0.1148	15	0.0280
16	0.0883	22.2830	0.1343	16	0.0415
17	0.0914	22.8908	0.1528	17	-0.0517
18	-0.0568	23.1364	0.1854	18	-0.2027
19	-0.0776	23.6184	0.2112	19	0.0951
20	-0.1069	24.5808	0.2179	20	0.1533
21	0.0548	24.8471	0.2538	21	0.0383
22	0.1588	27.2190	0.2030	22	0.1068
23	0.0601	27.5803	0.2321	23	0.0979
24	0.0158	27.6067	0.2770	24	-0.0369
25	0.0062	27.6111	0.3261	25	0.0016

Time Series Japan 12



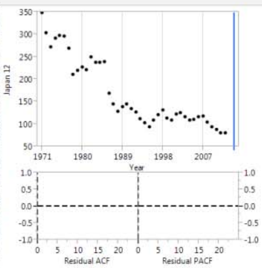
Mean	167.85017
Std	74.835339
N	42
Zero Mean ADF	-2.983452
Single Mean ADF	-2.290851
Trend ADF	-2.495699

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8790	34.8271	<.0001*	1	0.8790
2	0.7747	62.5560	<.0001*	2	0.0090
3	0.7040	86.0373	<.0001*	3	0.0932
4	0.6258	105.084	<.0001*	4	-0.0568
5	0.5631	120.920	<.0001*	5	0.0368
6	0.4869	133.091	<.0001*	6	-0.0981
7	0.4197	142.394	<.0001*	7	0.0038
8	0.3946	150.856	<.0001*	8	0.1268
9	0.3403	157.342	<.0001*	9	-0.1185
10	0.2725	161.632	<.0001*	10	-0.0761
11	0.2159	164.411	<.0001*	11	-0.0319
12	0.1405	165.627	<.0001*	12	-0.1220
13	0.0801	166.036	<.0001*	13	-0.0186
14	0.0119	166.045	<.0001*	14	-0.0933
15	-0.0687	166.368	<.0001*	15	-0.0858
16	-0.1086	167.206	<.0001*	16	0.0502
17	-0.1453	168.767	<.0001*	17	-0.0284
18	-0.1785	171.222	<.0001*	18	0.0081
19	-0.2149	174.933	<.0001*	19	-0.0877
20	-0.2497	180.171	<.0001*	20	0.0004
21	-0.2679	186.487	<.0001*	21	-0.0047
22	-0.2847	193.974	<.0001*	22	-0.0294
23	-0.2985	202.641	<.0001*	23	0.0426
24	-0.3103	212.526	<.0001*	24	-0.0466
25	-0.3156	223.351	<.0001*	25	0.0010

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARIMA(1, 2, 2	36	314.59164	353.07240	359.82792	0.921	345.0724	0.406348	8.216399	13.587300
☐	☐	ARIMA(2, 2, 2	35	322.85534	355.05758	363.50197	0.921	345.05758	0.150599	8.255664	13.640644
☐	☐	IMA(2, 2)	37	372.40787	356.50306	361.56970	0.913	350.50306	0.073104	8.019676	13.386627
☐	☐	IMA(2, 1)	38	378.5542	356.63128	360.00904	0.908	352.63128	0.068564	8.710350	14.408689
☐	☐	ARIMA(1, 1, 1	38	309.73097	356.87563	362.01635	0.936	350.87563	0.060679	7.733655	12.824638
☐	☐	ARIMA(1, 2, 1	37	379.03154	357.23517	362.30181	0.912	351.23517	0.050695	8.017259	13.424048
☐	☐	ARIMA(2, 2, 1	36	366.90303	357.35915	364.11467	0.914	349.35915	0.047648	8.051732	13.405980
☐	☐	IMA(1, 2)	38	325.75166	357.46341	362.60413	0.936	351.46341	0.045227	8.238068	13.376901
☐	☐	ARIMA(1, 1, 2	37	317.38472	358.84604	365.70033	0.936	350.84604	0.022655	7.838288	12.955188
☐	☐	ARIMA(2, 1, 1	37	317.59028	358.85435	365.70864	0.936	350.85435	0.022561	7.808152	12.918808
☐	☐	ARIMA(2, 1, 2	36	315.18096	359.59129	368.15915	0.938	349.59129	0.015608	7.901666	12.852424
☐	☐	IMA(1, 1)	39	365.35969	360.32422	363.75136	0.929	356.32422	0.010819	7.573662	12.734075
☐	☐	I(1)	40	375.84935	360.43729	362.15086	0.926	358.43729	0.010224	8.130996	13.545939
☐	☐	ARI(2, 1)	38	363.23826	361.07343	366.21414	0.931	355.07343	0.007439	7.561021	12.573166
☐	☐	ARI(1, 1)	39	372.67639	361.08736	364.51450	0.928	357.08736	0.007387	7.754796	13.042615
☐	☐	ARI(2, 2)	37	538.91815	368.21882	373.28545	0.889	362.21882	0.000209	9.175561	15.100248
☐	☐	ARI(1, 2)	38	564.41087	368.97496	372.35271	0.882	364.97496	0.000143	9.893472	16.127284
☐	☐	I(2)	39	597.99385	370.24559	371.93447	0.872	368.24559	0.000076	10.143491	16.613918
☐	☐	ARMA(2, 1)	38	344.25727	374.66540	381.61608	0.851	366.6654	0.000008	8.702373	16.034933
☐	☐	ARMA(1, 2)	38	381.16508	376.93875	383.88943	0.845	368.93875	0.000003	9.502693	17.174776
☐	☐	ARMA(1, 1)	39	398.53107	377.23866	382.45167	0.843	371.23866	0.000002	8.815254	16.259414
☐	☐	AR(2)	39	408.20447	378.18544	383.39845	0.844	372.18544	0.000001	8.940551	16.350224
☐	☐	AR(1)	40	428.3392	379.16855	382.64389	0.840	375.16855	0.000001	9.732588	17.171128
☐	☐	ARMA(2, 2)	37	392.7921	379.59949	388.28784	0.855	369.59949	0.000001	8.505918	15.827454
☐	☐	MA(2)	39	1066.7832	417.65602	422.86903	0.718	411.65602	0.000000	17.997092	28.196348
☐	☐	MA(1)	40	1724.6256	437.91897	441.39431	0.612	433.91897	0.000000	24.147484	37.544319
☐	☐	ARIMA(0, 0, 0	41	5736.9214	483.67522	485.41289	-0.00	481.67522	0.000000	43.828406	66.565269



Model: ARIMA(1, 2, 2)

Model Summary

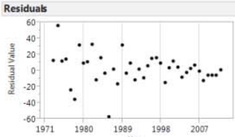
DF	36	Stable	Yes
Sum of Squared Errors	11325.299	Invertible	Yes
Variance Estimate	314.591639		
Standard Deviation	17.7367314		
Akaike's 'A' Information Criterion	353.072399		
Schwarz's Bayesian Criterion	359.827917		
RSquare	0.92079682		
RSquare Adj	0.91419656		
MAPE	8.21639893		
MAE	13.5872998		
-2LogLikelihood	345.072399		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	-0.5828272	0.1338232	-4.36	0.0001*	0.55270814
MA1	1	2.60632e-8	0.0000013	0.02	0.9844	
MA2	2	1.0000000	0.1091131	9.16	<.0001*	
Intercept	0	0.3491904	0.2781960	1.26	0.2175	

Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0356	0.0547	0.8151	1	0.0356
2	0.0246	0.0815	0.9600	2	0.0234
3	-0.1965	1.8344	0.6075	3	-0.1985
4	-0.3612	7.9220	0.0945	4	-0.3620
5	0.0923	8.3307	0.1389	5	0.1274
6	0.0196	8.3498	0.2136	6	0.0107
7	-0.0085	8.3534	0.3025	7	-0.1912
8	0.3082	13.3394	0.1007	8	0.2808
9	0.0883	13.7619	0.1311	9	0.2323
10	-0.0349	13.8301	0.1809	10	-0.1968
11	-0.1396	14.9594	0.1844	11	-0.1509
12	-0.3285	21.4343	0.0444*	12	-0.0006
13	-0.0259	21.4761	0.0640	13	-0.0367
14	-0.0493	21.6330	0.0865	14	-0.3098
15	0.0819	22.0838	0.1056	15	0.0273
16	0.0870	22.6141	0.1244	16	0.0451
17	0.0910	23.2195	0.1422	17	-0.0514
18	-0.0557	23.4561	0.1737	18	-0.2056
19	-0.0775	23.9370	0.1986	19	0.0986
20	-0.1055	24.8712	0.2064	20	0.1627
21	0.0540	25.1293	0.2416	21	0.0327
22	0.1594	27.5000	0.1928	22	0.1020
23	0.0571	27.8219	0.2226	23	0.1009
24	0.0177	27.8548	0.2662	24	-0.0303
25	0.0061	27.8590	0.3144	25	-0.0068

Norway

Time Series Norway 04

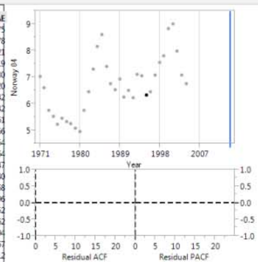
Mean	6.7046529
Std	1.0583015
N	34
Zero Mean ADF	-0.329991
Single Mean ADF	-1.610611
Trend ADF	-2.266682

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8469	26.6033	<.0001*	1	0.8469
2	0.5862	39.7461	<.0001*	2	-0.4635
3	0.3344	44.1626	<.0001*	3	0.0021
4	0.1446	45.0154	<.0001*	4	0.0053
5	-0.0153	45.0253	<.0001*	5	-0.1867
6	-0.0983	45.4475	<.0001*	6	0.1755
7	-0.1228	46.1313	<.0001*	7	-0.0599
8	-0.1425	47.0868	<.0001*	8	-0.1666
9	-0.1751	48.5885	<.0001*	9	-0.0010
10	-0.1878	50.3870	<.0001*	10	0.0101
11	-0.1345	51.3494	<.0001*	11	0.1788
12	-0.0293	51.3971	<.0001*	12	0.1035
13	0.0750	51.7247	<.0001*	13	-0.0594
14	0.1580	53.2528	<.0001*	14	0.0634
15	0.2376	56.8892	<.0001*	15	0.1362
16	0.2530	61.2425	<.0001*	16	-0.1973
17	0.1782	63.5297	<.0001*	17	-0.0813
18	0.0263	63.5828	<.0001*	18	-0.1945
19	-0.1299	64.9599	<.0001*	19	-0.1107
20	-0.2492	70.3887	<.0001*	20	0.0783
21	-0.3098	79.4259	<.0001*	21	-0.0047
22	-0.3119	89.3472	<.0001*	22	0.0142
23	-0.3081	99.9108	<.0001*	23	-0.2239
24	-0.2997	110.903	<.0001*	24	-0.0074
25	-0.2775	121.377	<.0001*	25	0.1131

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARIMA(2, 1, 2	28	0.2003276	54.977788	62.460326	0.805	44.977788	0.196382	6.084600	0.400775
☐	☐	MA(2)	31	0.2282759	55.563972	60.143054	0.782	49.563972	0.146492	6.598887	0.426878
☐	☐	ARIMA(2, 1, 1	29	0.258996	55.750849	61.736880	0.785	47.750849	0.133424	6.348656	0.420221
☐	☐	AR(2)	31	0.2651665	55.921874	60.500956	0.781	49.921874	0.122488	6.351696	0.422219
☐	☐	ARMA(2, 2)	29	0.2324199	56.391955	64.023758	0.806	46.391955	0.096832	5.857633	0.382330
☐	☐	ARMA(1, 2)	30	0.261919	56.773169	62.878611	0.789	48.773169	0.080027	6.149259	0.405420
☐	☐	ARI(1, 1)	31	0.3215096	58.283458	61.276473	0.737	54.283458	0.037608	6.438743	0.438442
☐	☐	IMA(1, 1)	31	0.3219601	58.310408	61.303423	0.737	54.310408	0.037105	6.669135	0.453842
☐	☐	ARMA(1, 1)	31	0.2866058	58.350653	62.929735	0.764	52.350653	0.036366	6.720323	0.450361
☐	☐	ARIMA(1, 1, 2	29	0.2979002	59.307028	65.293059	0.760	51.307028	0.022543	6.874069	0.460766
☐	☐	IMA(1, 2)	30	0.3223875	59.388778	63.878300	0.744	53.388778	0.021640	6.315282	0.428854
☐	☐	ARI(2, 1)	30	0.3243771	59.539404	64.028927	0.743	53.539404	0.020071	6.581116	0.446764
☐	☐	ARIMA(1, 1, 1	30	0.3286028	59.935654	64.425177	0.740	53.935654	0.016463	6.497490	0.441847
☐	☐	I(1)	32	0.3611045	61.021076	62.517583	0.696	59.021076	0.009568	7.231895	0.495740
☐	☐	ARIMA(1, 2, 1	29	0.3438062	62.171147	66.568354	0.720	56.171147	0.005384	6.661439	0.451368
☐	☐	AR(1)	32	0.3346838	62.365323	65.418045	0.717	58.365323	0.004886	7.338924	0.496796
☐	☐	IMA(2, 2)	29	0.3439324	62.548580	66.945788	0.717	56.54858	0.004458	6.958625	0.471852
☐	☐	ARIMA(2, 2, 1	28	0.3479862	63.714789	69.577732	0.724	55.714789	0.002488	6.739352	0.456262
☐	☐	ARIMA(1, 2, 2	28	0.3521905	63.928697	69.791641	0.722	55.928697	0.002236	6.663328	0.451394
☐	☐	IMA(2, 1)	30	0.4225488	65.499190	68.430662	0.665	61.49919	0.001020	7.179367	0.490967
☐	☐	ARIMA(2, 2, 2	27	0.3677844	66.000419	73.329099	0.721	56.000419	0.000794	6.599558	0.447612
☐	☐	ARMA(2, 1)	30	0.345421	66.554828	72.660270	0.718	58.554828	0.000601	7.370578	0.501877
☐	☐	I(2)	31	0.4632647	67.173496	68.639232	0.622	65.173496	0.000441	8.001214	0.541838
☐	☐	ARI(1, 2)	30	0.4515634	67.362240	70.293712	0.643	63.36224	0.000402	7.480895	0.509160
☐	☐	ARI(2, 2)	29	0.4479629	68.099892	72.497100	0.657	62.099892	0.000278	7.366087	0.500679
☐	☐	MA(1)	32	0.512282	76.490863	79.543584	0.565	72.490863	0.000004	8.928850	0.583627
☐	☐	ARIMA(0, 0, 0	33	1.1539415	102.34106	103.86742	-0.00	100.34106	0.000000	12.992381	0.844982



Model: ARIMA(2, 1, 2)

Model Summary

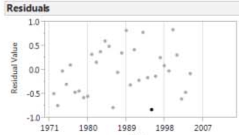
DF	28	Stable	Yes
Sum of Squared Errors	5.60917169	Invertible	No
Variance Estimate	0.20032756		
Standard Deviation	0.44757967		
Akaike's 'A' Information Criterion	54.9777881		
Schwarz's Bayesian Criterion	62.4603259		
RSquare	0.80536814		
RSquare Adj	0.77756359		
MAPE	6.08459997		
MAE	0.40077476		
-2LogLikelihood	44.9777881		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.667773	0.0867346	19.23	<.0001*	0.0122305
AR2	2	-0.874664	0.0767389	-11.40	<.0001*	
MA1	1	1.999977	0.2019552	9.90	<.0001*	
MA2	2	-0.999977	0.1981069	-5.05	<.0001*	
Intercept	0	0.059116	0.0086623	6.82	<.0001*	

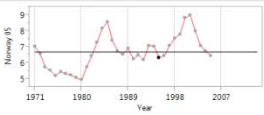
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.1709	1.0544	0.3045	1	0.1709
2	-0.0746	1.2617	0.5321	2	-0.1069
3	-0.1445	2.0654	0.5589	3	-0.1168
4	0.1208	2.6464	0.6186	4	0.1690
5	-0.1049	3.1003	0.6845	5	-0.1942
6	-0.0374	3.1601	0.7885	6	0.0272
7	0.1470	4.1200	0.7659	7	0.1972
8	0.1958	5.8911	0.6594	8	0.0574
9	0.0633	6.0842	0.7315	9	0.0814
10	-0.1782	7.6787	0.6602	10	-0.1701
11	-0.1807	9.3929	0.5857	11	-0.1496
12	-0.0668	9.6385	0.6476	12	-0.0000
13	-0.0428	9.7442	0.7147	13	-0.0980
14	-0.2384	13.1989	0.5109	14	-0.2630
15	0.0278	13.2483	0.5831	15	0.1039
16	0.0724	13.6042	0.6282	16	-0.0813
17	0.1260	14.7499	0.6135	17	0.1179
18	-0.0702	15.1292	0.6531	18	0.0990
19	-0.0619	15.4449	0.6939	19	-0.1026
20	-0.1554	17.5911	0.6143	20	-0.0789
21	-0.1713	20.4157	0.4951	21	-0.1610
22	0.0186	20.4522	0.5548	22	0.0806
23	0.0507	20.7494	0.5964	23	-0.0110
24	0.0385	20.9393	0.6423	24	-0.1553
25	0.0045	20.9422	0.6958	25	-0.0274

Time Series Norway 05



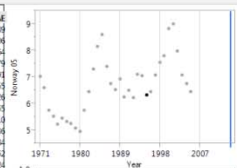
Mean	6.6971257
Std	1.0439963
N	35
Zero Mean ADF	-0.415088
Single Mean ADF	-1.633217
Trend ADF	-2.090083

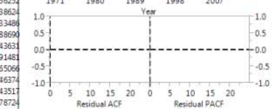
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8451	27.2023	<.0001*	1	0.8451
2	0.5825	40.5174	<.0001*	2	-0.4608
3	0.3251	44.7941	<.0001*	3	-0.0205
4	0.1285	45.4843	<.0001*	4	0.0057
5	-0.0300	45.5231	<.0001*	5	-0.1577
6	-0.1060	46.0249	<.0001*	6	0.1618
7	-0.1287	46.7908	<.0001*	7	-0.0783
8	-0.1450	47.7988	<.0001*	8	-0.1322
9	-0.1730	49.2895	<.0001*	9	-0.0251
10	-0.1844	51.0507	<.0001*	10	0.0023
11	-0.1359	52.0469	<.0001*	11	0.1802
12	-0.0312	52.1017	<.0001*	12	0.1129
13	0.0788	52.4671	<.0001*	13	-0.0427
14	0.1596	54.0376	<.0001*	14	0.0080
15	0.2403	57.7753	<.0001*	15	0.1913
16	0.2511	62.0736	<.0001*	16	-0.2314
17	0.1791	64.3814	<.0001*	17	-0.0445
18	0.0261	64.4331	<.0001*	18	-0.2112
19	-0.1345	65.8975	<.0001*	19	-0.1276
20	-0.2619	71.8185	<.0001*	20	0.0803
21	-0.3197	81.2749	<.0001*	21	0.0143
22	-0.3161	91.2261	<.0001*	22	0.0075
23	-0.3067	101.375	<.0001*	23	-0.2250
24	-0.2933	111.505	<.0001*	24	-0.0062
25	-0.2654	120.627	<.0001*	25	0.0853

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARIMA(2, 1, 2	29	0.1945934	55.484984	63.116787	0.805	45.484984	0.216720	5.947729	0.392189
☐	☐	AR(2)	32	0.2573568	56.402677	61.068721	0.781	50.402677	0.136970	6.235905	0.414606
☐	☐	MA(2)	32	0.2267977	56.748792	61.414836	0.778	50.748792	0.115204	6.558505	0.425364
☐	☐	ARIMA(2, 1, 1	30	0.2561944	56.818050	62.923492	0.782	48.81805	0.111283	6.334600	0.420279
☐	☐	ARMA(2, 2)	30	0.2406114	57.500245	65.276985	0.801	47.500245	0.079121	5.855539	0.384191
☐	☐	ARMA(1, 2)	31	0.2565047	57.580461	63.801853	0.787	49.580461	0.076010	6.132361	0.404555
☐	☐	ARMA(2, 1)	31	0.2647367	58.291315	64.512707	0.782	50.291315	0.053274	6.221847	0.413426
☐	☐	ARI(1, 1)	32	0.3122019	58.993932	62.046653	0.737	54.993932	0.037492	6.318423	0.430155
☐	☐	ARMA(1, 1)	32	0.2796185	59.082120	63.748164	0.763	53.08212	0.035875	6.637234	0.445010
☐	☐	IMA(1, 1)	32	0.3136546	59.128784	62.181505	0.736	55.128784	0.035048	6.572972	0.447136
☐	☐	IMA(1, 2)	31	0.3137587	60.168815	64.747896	0.743	54.168815	0.020836	6.234222	0.423384
☐	☐	ARIMA(1, 1, 2	30	0.2934013	60.370984	66.476426	0.756	52.370984	0.018833	6.792912	0.456252
☐	☐	ARI(2, 1)	31	0.3164756	60.409931	64.989012	0.741	54.409931	0.018470	6.461144	0.438624
☐	☐	ARIMA(1, 1, 1	31	0.3192914	60.690607	65.269688	0.739	54.690607	0.016051	6.376414	0.433486
☐	☐	I(1)	33	0.3526379	62.034162	63.560522	0.694	60.034162	0.008199	7.126714	0.488690
☐	☐	ARIMA(1, 2, 1	30	0.3332815	62.939149	67.428672	0.720	56.939149	0.005215	6.551276	0.443631
☐	☐	AR(1)	33	0.3271891	63.318489	66.429185	0.715	59.318489	0.004314	7.256827	0.491481
☐	☐	IMA(2, 2)	30	0.3345549	63.440700	67.930223	0.716	57.4407	0.004058	6.863304	0.465066
☐	☐	ARIMA(2, 2, 1	29	0.3389281	64.597864	70.583894	0.723	56.597864	0.002275	6.594402	0.446374
☐	☐	ARIMA(1, 2, 2	29	0.3416198	64.737373	70.723403	0.721	56.737373	0.002122	6.551509	0.443517
☐	☐	IMA(2, 1)	31	0.4093124	66.456344	69.449359	0.665	62.456344	0.000898	7.000950	0.478724
☐	☐	ARIMA(2, 2, 2	28	0.355501	66.749578	74.232116	0.721	56.749578	0.000776	6.480537	0.439201
☐	☐	I(2)	32	0.4488332	68.198049	69.694557	0.622	66.198049	0.000376	7.775161	0.526486
☐	☐	ARI(1, 2)	31	0.4379379	68.393024	71.386039	0.643	64.393024	0.000341	7.328971	0.498636
☐	☐	ARI(2, 2)	30	0.4346963	69.141034	73.630556	0.656	63.141034	0.000235	7.226162	0.490961
☐	☐	MA(1)	33	0.4987236	77.724936	80.835632	0.564	73.724936	0.000003	8.764355	0.573592
☐	☐	ARIMA(0, 0, 0	34	1.1219851	104.33962	105.89496	0.000	102.33962	0.000000	12.720522	0.828152





Model: ARIMA(2, 1, 2)

Model Summary

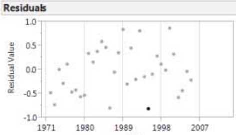
DF	29	Stable	Yes
Sum of Squared Errors	5.64320962	Invertible	No
Variance Estimate	0.19459344		
Standard Deviation	0.44112746		
Akaike's 'A' Information Criterion	55.4849841		
Schwarz's Bayesian Criterion	63.1167867		
RSquare	0.80459063		
RSquare Adj	0.77763762		
MAPE	5.94772928		
MAE	0.39218899		
-2LogLikelihood	45.4849841		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.678427	0.0825512	20.33	<.0001*	0.01179612
AR2	2	-0.884490	0.0726230	-12.18	<.0001*	
MA1	1	1.999991	0.2078492	9.62	<.0001*	
MA2	2	-0.999991	0.2047646	-4.88	<.0001*	
Intercept	0	0.057245	0.0081645	7.01	<.0001*	

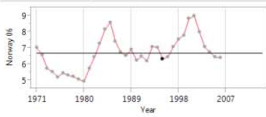
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.1626	0.9807	0.3220	1	0.1626
2	-0.0691	1.1632	0.5590	2	-0.0981
3	-0.1288	1.8178	0.6111	3	-0.1042
4	0.1158	2.3652	0.6689	4	0.1562
5	-0.1258	3.0331	0.6949	5	-0.2044
6	-0.0334	3.0820	0.7985	6	0.0367
7	0.1502	4.1042	0.7677	7	0.1862
8	0.1947	5.8882	0.6598	8	0.0657
9	0.0723	6.1442	0.7254	9	0.0988
10	-0.1470	7.2462	0.7020	10	-0.1550
11	-0.1665	8.7222	0.6475	11	-0.1436
12	-0.0830	9.1057	0.6939	12	-0.0145
13	-0.0323	9.1663	0.7603	13	-0.0621
14	-0.2485	12.9446	0.5309	14	-0.2797
15	0.0383	13.0389	0.5993	15	0.1104
16	0.0478	13.1941	0.6585	16	-0.1064
17	0.1124	14.1029	0.6598	17	0.0903
18	-0.0727	14.5070	0.6955	18	0.0975
19	-0.0394	14.6340	0.7456	19	-0.0980
20	-0.1676	17.0895	0.6472	20	-0.0916
21	-0.1908	20.5159	0.4888	21	-0.1577
22	0.0043	20.5178	0.5507	22	0.0741
23	0.0413	20.7079	0.5989	23	-0.0147
24	0.0212	20.7628	0.6527	24	-0.1230
25	0.0113	20.7802	0.7048	25	-0.0330

Time Series Norway 06



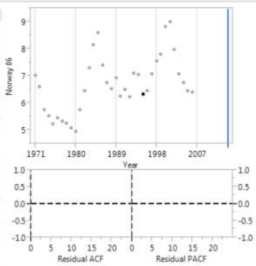
Mean	6.6891361
Std	1.0304789
N	36
Zero Mean ADF	-0.42458
Single Mean ADF	-1.655786
Trend ADF	-2.031867

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8452	27.9199	<.0001*	1	0.8452
2	0.5810	41.4997	<.0001*	2	-0.4669
3	0.3217	45.7900	<.0001*	3	-0.0177
4	0.1189	46.3948	<.0001*	4	-0.0170
5	-0.0468	46.4915	<.0001*	5	-0.1576
6	-0.1215	47.1651	<.0001*	6	0.1928
7	-0.1368	48.0473	<.0001*	7	-0.0894
8	-0.1510	49.1616	<.0001*	8	-0.1593
9	-0.1753	50.7189	<.0001*	9	0.0099
10	-0.1817	52.4557	<.0001*	10	-0.0145
11	-0.1321	53.4106	<.0001*	11	0.1770
12	-0.0329	53.4724	<.0001*	12	0.1155
13	0.0763	53.8185	<.0001*	13	-0.0414
14	0.1632	55.4743	<.0001*	14	0.0231
15	0.2413	59.2677	<.0001*	15	0.1415
16	0.2538	63.6725	<.0001*	16	-0.1729
17	0.1771	65.9303	<.0001*	17	-0.0932
18	0.0273	65.9868	<.0001*	18	-0.1616
19	-0.1346	67.4446	<.0001*	19	-0.1547
20	-0.2666	73.5203	<.0001*	20	0.0574
21	-0.3334	83.6575	<.0001*	21	0.0337
22	-0.3268	94.0910	<.0001*	22	0.0107
23	-0.3113	104.290	<.0001*	23	-0.2255
24	-0.2919	114.002	<.0001*	24	-0.0067
25	-0.2585	122.312	<.0001*	25	0.0762

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	33	0.249624	56.788362	61.538919	0.782	50.788362	0.181428	6.080078	0.404112
☐	☐	MA(2)	33	0.2206674	57.169037	61.919594	0.777	51.169037	0.149983	6.446135	0.417664
☐	☐	ARIMA(2, 1, 1	31	0.2496471	57.367737	63.589130	0.781	49.367737	0.135798	6.245475	0.414806
☐	☐	ARMA(2, 2)	31	0.233844	57.909087	65.826682	0.800	47.909087	0.103596	5.774715	0.378274
☐	☐	ARMA(1, 2)	32	0.2494163	57.986422	64.320498	0.787	49.986422	0.099666	5.996193	0.395762
☐	☐	ARMA(2, 1)	32	0.2566179	58.682987	65.017063	0.782	50.682987	0.070354	6.075109	0.403508
☐	☐	ARMA(1, 1)	33	0.271126	59.541870	64.292427	0.763	53.54187	0.045792	6.452573	0.432632
☐	☐	ARI(1, 1)	33	0.3030314	59.624260	62.734957	0.737	55.62426	0.043944	6.182143	0.420603
☐	☐	IMA(1, 1)	33	0.3042948	59.748132	62.858828	0.736	55.748132	0.041305	6.417396	0.436380
☐	☐	IMA(1, 2)	32	0.3042398	60.771035	65.437079	0.744	54.771035	0.024767	6.099946	0.414012
☐	☐	ARIMA(1, 1, 2	31	0.2844093	60.905208	67.126600	0.757	52.905208	0.023160	6.623919	0.445091
☐	☐	ARI(2, 1)	32	0.3066981	61.003212	65.669256	0.742	55.003212	0.022053	6.309432	0.428162
☐	☐	ARIMA(1, 1, 1	32	0.3095654	61.306994	65.973038	0.739	55.306994	0.018945	6.238610	0.423902
☐	☐	I(1)	34	0.3422723	62.785933	64.341281	0.695	60.785933	0.009044	6.928235	0.475085
☐	☐	ARIMA(2, 1, 2	30	0.2794803	63.299145	71.075886	0.756	53.299145	0.006997	6.320400	0.423573
☐	☐	ARIMA(1, 2, 1	31	0.3227507	63.626197	68.205279	0.720	57.626197	0.005941	6.394134	0.432850
☐	☐	AR(1)	34	0.3176911	63.985410	67.152448	0.716	59.98541	0.004965	7.084330	0.479886
☐	☐	IMA(2, 2)	31	0.3238952	64.116412	68.695494	0.717	58.116412	0.004650	6.692594	0.453379
☐	☐	ARIMA(2, 2, 1	30	0.3276933	65.255468	71.360910	0.723	57.255468	0.002631	6.444214	0.436055
☐	☐	ARIMA(1, 2, 2	30	0.3304318	65.412010	71.517452	0.722	57.41201	0.002433	6.401020	0.433192
☐	☐	ARIMA(2, 2, 2	29	0.3434714	67.431562	75.063364	0.722	57.431562	0.000886	6.323908	0.428487
☐	☐	IMA(2, 1)	32	0.3997248	67.625227	70.677948	0.663	63.625227	0.000804	6.902857	0.471641
☐	☐	I(2)	33	0.4372647	69.347458	70.873819	0.621	67.347458	0.000340	7.651907	0.517823
☐	☐	ARI(1, 2)	32	0.4264465	69.502953	72.555674	0.642	65.502953	0.000315	7.219802	0.490904
☐	☐	ARI(2, 2)	31	0.4252889	70.394507	74.973588	0.653	64.394507	0.000201	7.141482	0.484999
☐	☐	MA(1)	34	0.4842903	78.813618	81.980656	0.565	74.813618	0.000003	8.555125	0.560141
☐	☐	ARIMA(0, 0, 0	35	1.0922264	106.32528	107.90880	-0.00	104.32528	0.000000	12.470297	0.812694



Model: AR(2)

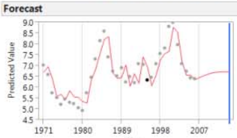
Model Summary

DF	33	Stable	Yes
Sum of Squared Errors	8.23759112	Invertible	Yes
Variance Estimate	0.24962397		
Standard Deviation	0.49962383		
Akaike's 'A' Information Criterion	56.7883624		
Schwarz's Bayesian Criterion	61.5389192		
RSquare	0.78172809		
RSquare Adj	0.76849949		
MAPE	6.0800778		
MAE	0.40411246		
-2LogLikelihood	50.7883624		

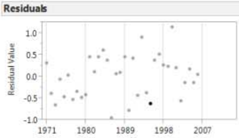
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.232813	0.1426366	8.64	<.0001*	1.56392711
AR2	2	-0.465825	0.1412829	-3.30	0.0023*	
Intercept	0	6.711806	0.3305944	20.30	<.0001*	

Forecast

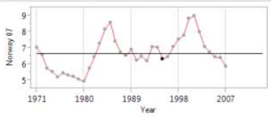


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	-0.0033	0.0004	0.9836	1	-0.0033
2	0.0164	0.0112	0.9944	2	0.0164
3	-0.0709	0.2195	0.9744	3	-0.0708
4	0.2036	1.9915	0.7373	4	0.2040
5	-0.1659	3.2061	0.6682	5	-0.1738
6	-0.0914	3.5871	0.7324	6	-0.0999
7	0.0325	3.6368	0.8205	7	0.0777
8	0.0487	3.7527	0.8787	8	-0.0196
9	-0.0132	3.7615	0.9264	9	0.0414
10	-0.1346	4.7144	0.9094	10	-0.1282
11	-0.0864	5.1224	0.9251	11	-0.1441
12	0.0413	5.2194	0.9502	12	0.0699
13	0.1161	6.0216	0.9454	13	0.1246
14	-0.1583	7.5807	0.9100	14	-0.1496
15	0.1434	8.9208	0.8816	15	0.1791
16	0.1074	9.7091	0.8814	16	0.0446
17	0.1565	11.4715	0.8310	17	0.0912
18	-0.0750	11.8988	0.8524	18	0.0836
19	-0.0273	11.9589	0.8874	19	-0.1587
20	-0.1149	13.0882	0.8736	20	-0.1502
21	-0.1774	15.9569	0.7721	21	-0.1992
22	0.0158	15.9814	0.8168	22	0.0733
23	-0.0648	16.4231	0.8366	23	0.0059
24	-0.0903	17.3525	0.8332	24	-0.1600
25	-0.0547	17.7240	0.8539	25	-0.0507

Time Series Norway 07



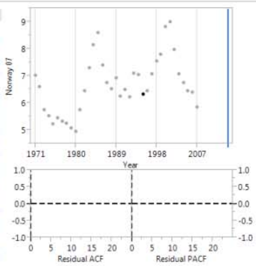
Mean	6.6666108
Std	1.0254039
N	37
Zero Mean ADF	-0.570984
Single Mean ADF	-1.611455
Trend ADF	-1.734598

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8363	28.0328	<.0001*	1	0.8363
2	0.5762	41.7198	<.0001*	2	-0.4098
3	0.3157	45.9499	<.0001*	3	-0.0836
4	0.1098	46.4771	<.0001*	4	-0.0096
5	-0.0718	46.7097	<.0001*	5	-0.1948
6	-0.1670	48.0078	<.0001*	6	0.1396
7	-0.1786	49.5418	<.0001*	7	0.0391
8	-0.1714	51.0044	<.0001*	8	-0.1643
9	-0.1896	52.8568	<.0001*	9	-0.1026
10	-0.1853	54.6928	<.0001*	10	0.0795
11	-0.1229	55.5311	<.0001*	11	0.1244
12	-0.0225	55.5604	<.0001*	12	0.0904
13	0.0692	55.8483	<.0001*	13	-0.0037
14	0.1525	57.3078	<.0001*	14	0.0275
15	0.2469	61.3074	<.0001*	15	0.1530
16	0.2531	65.7090	<.0001*	16	-0.2375
17	0.1827	68.1178	<.0001*	17	0.0142
18	0.0219	68.1542	<.0001*	18	-0.2763
19	-0.1291	69.4904	<.0001*	19	-0.0164
20	-0.2631	75.3659	<.0001*	20	-0.0170
21	-0.3428	85.9627	<.0001*	21	-0.0193
22	-0.3620	98.5697	<.0001*	22	0.0089
23	-0.3389	110.408	<.0001*	23	-0.1611
24	-0.3025	120.563	<.0001*	24	-0.0237
25	-0.2517	128.184	<.0001*	25	0.0628

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	34	0.2528273	58.726508	63.559261	0.775	52.726508	0.180932	6.214119	0.412137
☐	☐	MA(2)	34	0.2252426	59.289412	64.122166	0.771	53.289412	0.136547	6.467917	0.418813
☐	☐	ARMA(2, 2)	32	0.2155221	59.924541	67.979130	0.794	49.924541	0.099395	5.856648	0.382311
☐	☐	ARMA(1, 2)	33	0.2544493	60.050408	66.494079	0.780	52.050408	0.093333	6.081911	0.402472
☐	☐	ARIMA(2, 1, 1	32	0.2632633	60.456446	66.790521	0.768	52.456446	0.076184	6.370568	0.423279
☐	☐	ARMA(2, 1)	33	0.2588781	60.515499	66.959171	0.777	52.515499	0.073968	6.195366	0.410457
☐	☐	ARIMA(2, 1, 2	31	0.2473604	60.947971	68.865566	0.780	50.947971	0.059584	5.841998	0.391178
☐	☐	ARI(1, 1)	34	0.3020501	61.154075	64.321113	0.735	57.154075	0.053750	6.248648	0.423433
☐	☐	IMA(1, 1)	34	0.3042813	61.392735	64.559772	0.733	57.392735	0.047704	6.478349	0.438665
☐	☐	ARMA(1, 1)	34	0.2743321	61.525500	66.358254	0.757	55.5255	0.044640	6.557900	0.438559
☐	☐	IMA(1, 2)	33	0.3033604	62.321247	67.071804	0.741	56.321247	0.029987	6.165253	0.416839
☐	☐	ARI(2, 1)	33	0.306909	62.680138	67.430695	0.738	56.680138	0.025061	6.354207	0.429436
☐	☐	ARIMA(1, 1, 1	33	0.3089457	62.902428	67.652984	0.736	56.902428	0.022425	6.287156	0.425403
☐	☐	ARIMA(1, 1, 2	32	0.2910089	63.177151	69.511227	0.749	55.177151	0.019547	6.613786	0.444083
☐	☐	I(1)	35	0.3404823	64.363308	65.946827	0.693	62.363308	0.010802	6.936114	0.474341
☐	☐	ARIMA(1, 2, 1	32	0.3209136	65.165527	69.831571	0.718	59.165527	0.007233	6.519049	0.439002
☐	☐	IMA(2, 2)	32	0.3227731	65.740261	70.406305	0.714	59.740261	0.005426	6.761421	0.455820
☐	☐	AR(1)	35	0.3185896	65.801920	69.023756	0.710	61.80192	0.005262	7.142490	0.482718
☐	☐	ARIMA(2, 2, 1	31	0.3266867	66.877299	73.098691	0.720	58.877299	0.003073	6.506858	0.438042
☐	☐	ARIMA(1, 2, 2	31	0.3287726	66.994163	73.215555	0.719	58.994163	0.002899	6.514365	0.438604
☐	☐	IMA(2, 1)	33	0.3906774	68.780330	71.891026	0.666	64.78033	0.001187	6.862267	0.467159
☐	☐	ARI(1, 2)	33	0.4201382	70.972677	74.083373	0.642	66.972677	0.000397	7.263203	0.491433
☐	☐	I(2)	34	0.4325499	70.979116	72.534464	0.621	68.979116	0.000395	7.715505	0.519592
☐	☐	ARI(2, 2)	32	0.418291	71.806611	76.472655	0.654	65.806611	0.000261	7.202551	0.486740
☐	☐	ARIMA(2, 2, 2	30	0.4886935	78.922464	86.699204	0.621	68.922464	0.000007	7.709345	0.519163
☐	☐	MA(1)	35	0.4867191	81.111072	84.332908	0.558	77.111072	0.000002	8.604948	0.563228
☐	☐	ARIMA(0, 0, 0	36	1.0806601	108.85786	110.46878	0.000	106.85786	0.000000	12.448478	0.811428



Model: AR(2)

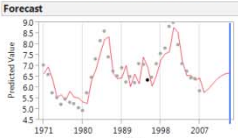
Model Summary

DF	34	Stable	Yes
Sum of Squared Errors	8.59612908	Invertible	Yes
Variance Estimate	0.25282733		
Standard Deviation	0.50281938		
Akaike's 'A' Information Criterion	58.7265076		
Schwarz's Bayesian Criterion	63.5592614		
RSquare	0.77542935		
RSquare Adj	0.76221931		
MAPE	6.21411866		
MAE	0.41213673		
-2LogLikelihood	52.7265076		

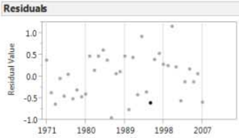
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.235669	0.1436313	8.60	<.0001*	1.52122234
AR2	2	-0.464591	0.1422630	-3.27	0.0025*	
Intercept	0	6.645155	0.3344961	19.87	<.0001*	

Forecast

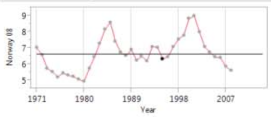


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	-0.0121	0.0059	0.9387	1	-0.0121
2	0.0162	0.0167	0.9917	2	0.0160
3	-0.0822	0.3032	0.9594	3	-0.0818
4	0.1999	2.0506	0.7264	4	0.1992
5	-0.1184	2.6826	0.7488	5	-0.1204
6	-0.1018	3.1654	0.7878	6	-0.1170
7	-0.0453	3.2643	0.8595	7	-0.0068
8	0.0312	3.3126	0.9132	8	-0.0253
9	-0.0304	3.3601	0.9483	9	-0.0007
10	-0.1590	4.7108	0.9096	10	-0.1440
11	-0.1075	5.3520	0.9129	11	-0.1292
12	0.0844	5.7627	0.9276	12	0.0778
13	0.1396	6.9342	0.9055	13	0.1336
14	-0.2122	9.7582	0.7796	14	-0.2097
15	0.1586	11.4078	0.7232	15	0.2016
16	0.0735	11.7793	0.7590	16	0.0144
17	0.2037	14.7732	0.6118	17	0.1175
18	-0.0992	15.5201	0.6260	18	0.0469
19	-0.0390	15.6418	0.6810	19	-0.1722
20	-0.1109	16.6863	0.6732	20	-0.1257
21	-0.1060	17.7006	0.6679	21	-0.1780
22	-0.0015	17.7008	0.7236	22	0.0831
23	-0.1042	18.8193	0.7117	23	-0.0292
24	-0.1212	20.4503	0.6709	24	-0.1925
25	-0.0582	20.8573	0.7005	25	-0.0848

Time Series Norway 08



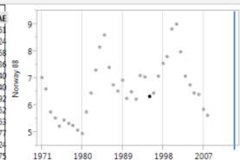
Mean	6.6395026
Std	1.0251697
N	38
Zero Mean ADF	-0.626936
Single Mean ADF	-1.571001
Trend ADF	-1.585937

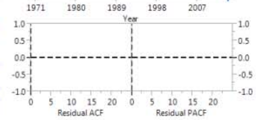
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8353	28.6634	<.0001*	1	0.8353
2	0.5682	42.2962	<.0001*	2	-0.4284
3	0.3145	46.5905	<.0001*	3	-0.0230
4	0.1071	47.1031	<.0001*	4	-0.0728
5	-0.0777	47.3813	<.0001*	5	-0.1795
6	-0.1932	49.1545	<.0001*	6	0.0744
7	-0.2306	51.7622	<.0001*	7	0.0061
8	-0.2196	54.2050	<.0001*	8	-0.0398
9	-0.2117	56.5537	<.0001*	9	-0.1085
10	-0.2006	58.7381	<.0001*	10	-0.0217
11	-0.1277	59.6566	<.0001*	11	0.1939
12	-0.0140	59.6680	<.0001*	12	0.0468
13	0.0783	60.0405	<.0001*	13	-0.0353
14	0.1401	61.2832	<.0001*	14	0.0430
15	0.2293	64.7574	<.0001*	15	0.2067
16	0.2573	69.3329	<.0001*	16	-0.2265
17	0.1819	71.7273	<.0001*	17	-0.1325
18	0.0313	71.8019	<.0001*	18	-0.0849
19	-0.1325	73.2058	<.0001*	19	-0.1554
20	-0.2529	78.6059	<.0001*	20	0.0592
21	-0.3359	88.6935	<.0001*	21	-0.0711
22	-0.3713	101.794	<.0001*	22	0.0051
23	-0.3805	116.462	<.0001*	23	-0.2064
24	-0.3354	128.674	<.0001*	24	0.0423
25	-0.2646	136.863	<.0001*	25	0.0682

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	35	0.2459819	59.175692	64.088451	0.781	53.175692	0.191833	6.113429	0.405061
☐	☐	MA(2)	35	0.2218213	60.116079	65.028837	0.774	54.116079	0.119873	6.444305	0.416724
☐	☐	ARMA(1, 2)	34	0.2474497	60.496540	67.046885	0.785	52.49654	0.099107	5.989981	0.395958
☐	☐	ARMA(2, 2)	33	0.2268928	60.563048	68.750978	0.797	50.563048	0.095865	5.811525	0.379236
☐	☐	ARMA(2, 1)	34	0.2518707	60.994081	67.544426	0.782	52.994081	0.077280	6.103205	0.403940
☐	☐	ARIMA(2, 1, 1	33	0.2574751	61.108437	67.552108	0.773	53.108437	0.072985	6.278749	0.416740
☐	☐	ARIMA(2, 1, 2	32	0.2399304	61.324271	69.378860	0.785	51.324271	0.065519	5.743260	0.383992
☐	☐	ARI(1, 1)	35	0.2934284	61.724608	64.946444	0.741	57.724608	0.053633	6.086354	0.412352
☐	☐	IMA(1, 1)	35	0.2955869	61.969898	65.191734	0.739	57.969898	0.047443	6.304249	0.426863
☐	☐	ARMA(1, 1)	35	0.2670992	62.085037	66.997795	0.762	56.085037	0.044788	6.453543	0.431077
☐	☐	IMA(1, 2)	34	0.2945109	62.872769	67.705523	0.747	56.872769	0.030207	6.019210	0.406724
☐	☐	ARI(2, 1)	34	0.2979194	63.239636	68.072390	0.745	57.239636	0.025145	6.199077	0.418775
☐	☐	ARIMA(1, 1, 1	34	0.29989	63.467848	68.300602	0.743	57.467848	0.022433	6.131880	0.414738
☐	☐	ARIMA(1, 1, 2	33	0.2832364	63.768815	70.212486	0.755	55.768815	0.019299	6.466238	0.433891
☐	☐	I(1)	36	0.3319675	65.187120	66.798038	0.700	63.18712	0.009496	6.822028	0.465888
☐	☐	ARIMA(1, 2, 1	33	0.3112264	65.801043	70.551600	0.725	59.801043	0.006986	6.361679	0.428125
☐	☐	IMA(2, 2)	33	0.3130427	66.377489	71.128046	0.721	60.377489	0.005237	6.595292	0.444390
☐	☐	AR(1)	36	0.3126735	66.820977	70.096150	0.715	62.820977	0.004195	7.099479	0.478837
☐	☐	ARIMA(2, 2, 1	32	0.3166084	67.508922	73.842998	0.727	59.508922	0.002974	6.369197	0.428390
☐	☐	ARIMA(1, 2, 2	32	0.3186017	67.628944	73.963019	0.726	59.628944	0.002801	6.362953	0.428060
☐	☐	ARIMA(2, 2, 2	31	0.3294645	69.551337	77.468932	0.727	59.551337	0.001071	6.270723	0.422338
☐	☐	IMA(2, 1)	34	0.37956	69.658126	72.825163	0.674	65.658126	0.001016	6.712786	0.456337
☐	☐	ARI(1, 2)	34	0.4089639	71.978502	75.145540	0.650	67.978502	0.000318	7.146188	0.482513
☐	☐	I(2)	35	0.4233648	72.206665	73.790184	0.628	70.206665	0.000284	7.650151	0.513504
☐	☐	ARI(2, 2)	33	0.407193	72.810970	77.561527	0.662	66.81097	0.000210	7.094909	0.478494
☐	☐	MA(1)	36	0.4787223	82.619613	85.894786	0.564	78.619613	0.000002	8.554464	0.559374
☐	☐	ARIMA(0, 0, 0	37	1.0793775	111.72855	113.36613	0.000	109.72855	0.000000	12.507781	0.814329





Model: AR(2)

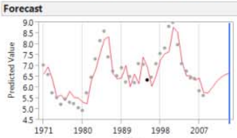
Model Summary

DF	35	Stable	Yes
Sum of Squared Errors	8.60936499	Invertible	Yes
Variance Estimate	0.24598186		
Standard Deviation	0.49596558		
Akaike's 'A' Information Criterion	59.1756921		
Schwarz's Bayesian Criterion	64.0884506		
RSquare	0.7806547		
RSquare Adj	0.76812068		
MAPE	6.11342876		
MAE	0.40506087		
-2LogLikelihood	53.1756921		

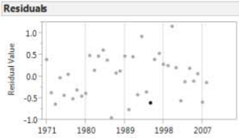
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.243502	0.1397710	8.90	<.0001*	1.50315166
AR2	2	-0.470218	0.1394367	-3.37	0.0018*	
Intercept	0	6.630105	0.3296087	20.12	<.0001*	

Forecast

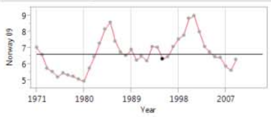


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	-0.0117	0.0056	0.9401	1	-0.0117
2	0.0105	0.0103	0.9949	2	0.0103
3	-0.0824	0.3050	0.9591	3	-0.0822
4	0.1982	2.0615	0.7244	4	0.1977
5	-0.1154	2.6746	0.7500	5	-0.1181
6	-0.0915	3.0718	0.7998	6	-0.1039
7	-0.0458	3.1745	0.8684	7	-0.0091
8	0.0160	3.1874	0.9221	8	-0.0421
9	-0.0320	3.2410	0.9540	9	-0.0017
10	-0.1606	4.6419	0.9138	10	-0.1498
11	-0.1143	5.3777	0.9115	11	-0.1355
12	0.0796	5.7484	0.9282	12	0.0785
13	0.1498	7.1136	0.8962	13	0.1382
14	-0.2090	9.8790	0.7710	14	-0.2085
15	0.1418	11.2070	0.7378	15	0.1863
16	0.0776	11.6227	0.7695	16	0.0217
17	0.1960	14.4045	0.6383	17	0.1059
18	-0.0880	14.9925	0.6625	18	0.0533
19	-0.0462	15.1633	0.7122	19	-0.1749
20	-0.1106	16.1953	0.7044	20	-0.1301
21	-0.1059	17.1974	0.6991	21	-0.1763
22	0.0176	17.2269	0.7507	22	0.0859
23	-0.1079	18.4059	0.7351	23	-0.0295
24	-0.1293	20.2218	0.6841	24	-0.1950
25	-0.0630	20.6860	0.7100	25	-0.0899

Time Series Norway 09



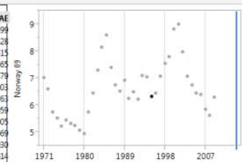
Mean	6.6305615
Std	1.013441
N	39
Zero Mean ADF	-0.463082
Single Mean ADF	-1.747765
Trend ADF	-1.90222

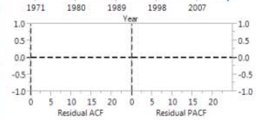
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8415	29.7952	<.0001*	1	0.8415
2	0.5735	44.0099	<.0001*	2	-0.4610
3	0.3160	48.4464	<.0001*	3	-0.0049
4	0.1093	48.9922	<.0001*	4	-0.0586
5	-0.0772	49.2724	<.0001*	5	-0.2104
6	-0.1951	51.1162	<.0001*	6	0.1061
7	-0.2400	53.9951	<.0001*	7	-0.0304
8	-0.2378	56.9127	<.0001*	8	-0.0525
9	-0.2285	59.6967	<.0001*	9	-0.0648
10	-0.2088	62.1015	<.0001*	10	-0.0261
11	-0.1340	63.1274	<.0001*	11	0.1817
12	-0.0167	63.1439	<.0001*	12	0.0575
13	0.0805	63.5421	<.0001*	13	-0.0591
14	0.1429	64.8475	<.0001*	14	0.0526
15	0.2252	68.2253	<.0001*	15	0.2054
16	0.2525	72.6571	<.0001*	16	-0.2446
17	0.1848	75.1401	<.0001*	17	-0.0936
18	0.0324	75.2202	<.0001*	18	-0.1399
19	-0.1289	76.5490	<.0001*	19	-0.1117
20	-0.2545	81.9986	<.0001*	20	0.0432
21	-0.3339	91.9013	<.0001*	21	-0.0576
22	-0.3710	104.848	<.0001*	22	-0.0247
23	-0.3859	119.733	<.0001*	23	-0.1963
24	-0.3517	132.916	<.0001*	24	0.0401
25	-0.2777	141.725	<.0001*	25	0.0799

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	36	0.2469823	60.718063	65.708748	0.775	54.718063	0.214081	6.175234	0.407199
☐	☐	ARIMA(2, 1, 1	34	0.253403	62.172038	68.722382	0.770	54.172038	0.103479	6.350950	0.419428
☐	☐	ARMA(1, 2)	35	0.2497044	62.215995	68.870242	0.778	54.215995	0.101229	6.073731	0.399415
☐	☐	ARIMA(2, 1, 2	33	0.2057313	62.251531	70.439462	0.786	52.251531	0.099446	5.969399	0.394365
☐	☐	MA(2)	36	0.2437276	62.261243	67.251928	0.765	56.261243	0.098965	6.526958	0.420479
☐	☐	ARMA(2, 1)	35	0.2532947	62.614067	69.268314	0.776	54.614067	0.082959	6.176538	0.406903
☐	☐	ARMA(2, 2)	34	0.2474352	63.107704	71.425513	0.785	53.107704	0.064815	6.027497	0.394763
☐	☐	ARMA(1, 1)	36	0.2662241	63.430562	68.421247	0.758	57.430562	0.055153	6.496631	0.432059
☐	☐	IMA(1, 1)	36	0.3002645	64.193516	67.468688	0.728	60.193516	0.037661	6.454858	0.434905
☐	☐	ARI(1, 1)	36	0.3011185	64.310699	67.585871	0.728	60.310699	0.035518	6.257232	0.421669
☐	☐	ARIMA(1, 1, 2	34	0.2801519	65.108218	71.658562	0.750	57.108218	0.023838	6.611977	0.441030
☐	☐	IMA(1, 2)	35	0.3025255	65.491792	70.404550	0.734	59.491792	0.019678	6.198389	0.416614
☐	☐	ARI(2, 1)	35	0.3028607	65.504777	70.417536	0.733	59.504777	0.019550	6.388943	0.429591
☐	☐	ARIMA(1, 1, 1	35	0.3061087	65.882439	70.795197	0.731	59.882439	0.016186	6.327224	0.425917
☐	☐	I(1)	37	0.3355881	67.334843	68.972429	0.689	65.334843	0.007830	6.991339	0.474403
☐	☐	AR(1)	37	0.3112569	68.261008	71.588131	0.710	64.261008	0.004928	7.147731	0.479912
☐	☐	ARIMA(1, 2, 1	34	0.3186239	68.386411	73.219165	0.711	62.386411	0.004628	6.432025	0.431609
☐	☐	IMA(2, 2)	34	0.3177731	68.632774	73.465528	0.710	62.632774	0.004092	6.707574	0.450444
☐	☐	ARIMA(2, 2, 1	33	0.3215883	69.886121	76.329793	0.715	61.886121	0.002187	6.538648	0.438375
☐	☐	ARIMA(1, 2, 2	33	0.3246013	70.084642	76.528313	0.714	62.084642	0.001980	6.481733	0.434723
☐	☐	IMA(2, 1)	35	0.3547581	72.239149	75.460985	0.665	68.239149	0.000674	7.376111	0.496163
☐	☐	ARIMA(2, 2, 2	32	0.3380096	72.297009	80.351598	0.712	62.297009	0.000655	6.392193	0.429080
☐	☐	I(2)	36	0.4319447	74.927752	76.538670	0.610	72.927752	0.000176	7.773532	0.520743
☐	☐	ARI(1, 2)	35	0.4221461	75.087750	78.309586	0.629	71.08775	0.000162	7.313801	0.492438
☐	☐	ARI(2, 2)	34	0.4160832	75.566691	80.399445	0.645	69.566691	0.000128	7.219990	0.485404
☐	☐	MA(1)	37	0.4657737	83.653834	86.980957	0.566	79.653834	0.000002	8.337475	0.545200
☐	☐	ARIMA(0, 0, 0	38	1.0540907	113.71862	115.38218	0.000	111.71862	0.000000	12.295330	0.801244





Model: AR(2)

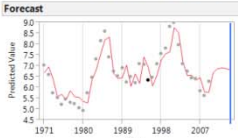
Model Summary

DF	36	Stable	Yes
Sum of Squared Errors	8.89136117	Invertible	Yes
Variance Estimate	0.24698225		
Standard Deviation	0.49697309		
Akaike's 'A' Information Criterion	60.7180634		
Schwarz's Bayesian Criterion	65.7087483		
RSquare	0.77504076		
RSquare Adj	0.76254302		
MAPE	6.17523405		
MAE	0.40719948		
-2LogLikelihood	54.7180634		

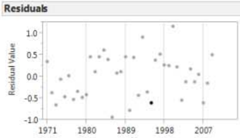
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.229119	0.1396286	8.80	<.0001*	1.59819369
AR2	2	-0.468243	0.1399284	-3.35	0.0019*	
Intercept	0	6.683542	0.3107417	21.51	<.0001*	

Forecast

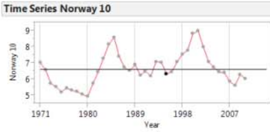


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	-0.0022	0.0002	0.9885	1	-0.0022
2	-0.0064	0.0020	0.9990	2	-0.0064
3	-0.0661	0.1961	0.9782	3	-0.0661
4	0.1895	1.8368	0.7657	4	0.1900
5	-0.1010	2.3162	0.8039	5	-0.1075
6	-0.0958	2.7610	0.8382	6	-0.0989
7	-0.0826	3.1022	0.8754	7	-0.0582
8	0.0194	3.1216	0.9265	8	-0.0304
9	0.0298	3.1689	0.9572	9	0.0595
10	-0.1475	4.3683	0.9292	10	-0.1414
11	-0.0975	4.9116	0.9354	11	-0.0948
12	0.1032	5.5420	0.9374	12	0.0984
13	0.1656	7.2278	0.8900	13	0.1272
14	-0.2335	10.7140	0.7083	14	-0.2206
15	0.1229	11.7196	0.7001	15	0.1744
16	0.1282	12.8618	0.6828	16	0.0882
17	0.1642	14.8202	0.6084	17	0.0674
18	-0.0609	15.1029	0.6549	18	0.0639
19	-0.0867	15.7041	0.6769	19	-0.1630
20	-0.0866	16.3348	0.6956	20	-0.1071
21	-0.0991	17.2065	0.6985	21	-0.1611
22	0.0090	17.2141	0.7514	22	0.0716
23	-0.1651	19.9397	0.6455	23	-0.0555
24	-0.1075	21.1725	0.6285	24	-0.1802
25	-0.0331	21.2979	0.6759	25	-0.0706

Time Series Norway 10



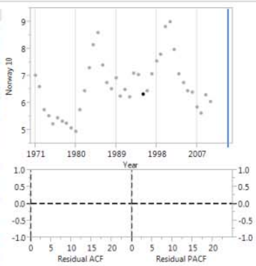
Mean	6.615925
Std	1.0048587
N	40
Zero Mean ADF	-0.5278
Single Mean ADF	-1.741574
Trend ADF	-1.820246

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8393	30.3437	<.0001*	1	0.8393
2	0.5832	45.3789	<.0001*	2	-0.4102
3	0.3253	50.1842	<.0001*	3	-0.0839
4	0.1129	50.7795	<.0001*	4	-0.0376
5	-0.0719	51.0276	<.0001*	5	-0.1685
6	-0.1926	52.8611	<.0001*	6	0.0345
7	-0.2417	55.8359	<.0001*	7	0.0135
8	-0.2523	59.1781	<.0001*	8	-0.0909
9	-0.2577	62.7773	<.0001*	9	-0.0918
10	-0.2358	65.8899	<.0001*	10	0.0419
11	-0.1475	67.1496	<.0001*	11	0.1648
12	-0.0278	67.1959	<.0001*	12	0.0306
13	0.0748	67.5437	<.0001*	13	-0.0163
14	0.1450	68.9023	<.0001*	14	0.0074
15	0.2278	72.3883	<.0001*	15	0.1811
16	0.2442	76.5642	<.0001*	16	-0.1893
17	0.1763	78.8344	<.0001*	17	-0.1080
18	0.0379	78.9439	<.0001*	18	-0.1267
19	-0.1261	80.2163	<.0001*	19	-0.1824
20	-0.2471	85.3464	<.0001*	20	0.1070
21	-0.3351	95.2777	<.0001*	21	-0.0855
22	-0.3663	107.799	<.0001*	22	0.0131
23	-0.3844	122.399	<.0001*	23	-0.2429
24	-0.3601	136.015	<.0001*	24	0.0352
25	-0.3043	146.383	<.0001*	25	0.0696

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	37	0.2512443	62.775821	67.842459	0.766	56.775821	0.241569	6.291720	0.41536
☐	☐	ARMA(2, 1)	36	0.2560143	64.468351	71.223869	0.768	56.468351	0.103637	6.337398	0.41752
☐	☐	ARMA(1, 2)	36	0.2580092	64.794783	71.550301	0.766	56.794783	0.088030	6.237626	0.41195
☐	☐	ARIMA(2, 1, 1	35	0.2639161	64.897371	71.551617	0.757	56.897371	0.083628	6.387324	0.42351
☐	☐	ARMA(1, 1)	37	0.2662614	64.945220	70.011858	0.752	58.94522	0.081651	6.545038	0.43507
☐	☐	IMA(1, 1)	37	0.2977645	65.490868	68.817991	0.726	61.490868	0.062155	6.454944	0.43424
☐	☐	ARI(1, 1)	37	0.2987067	65.617038	68.944162	0.725	61.617038	0.058355	6.281202	0.42277
☐	☐	ARIMA(2, 1, 2	34	0.243957	65.999676	74.317484	0.767	55.999676	0.048194	6.275397	0.41577
☐	☐	ARMA(2, 2)	35	0.2603377	66.185752	74.630149	0.769	56.185752	0.043912	6.199110	0.40847
☐	☐	ARIMA(1, 1, 2	35	0.2813553	66.771372	73.425618	0.744	58.771372	0.032766	6.591464	0.43995
☐	☐	ARI(2, 1)	36	0.3020987	67.021431	72.012116	0.729	61.021431	0.028915	6.418056	0.43108
☐	☐	IMA(1, 2)	36	0.3024481	67.074244	72.064928	0.729	61.074244	0.028161	6.271006	0.42132
☐	☐	MA(2)	37	0.2749763	67.274767	72.341406	0.738	61.274767	0.025475	6.729863	0.43526
☐	☐	ARIMA(1, 1, 1	36	0.3042838	67.283780	72.274465	0.727	61.28378	0.025360	6.358799	0.42750
☐	☐	I(1)	38	0.3280717	68.197761	69.861322	0.690	66.197761	0.016058	6.885716	0.46700
☐	☐	AR(1)	38	0.3053564	69.181023	72.558782	0.710	65.181023	0.009821	7.078003	0.47507
☐	☐	ARIMA(1, 2, 1	35	0.3159822	69.860860	74.773619	0.707	63.86086	0.006991	6.527668	0.43694
☐	☐	IMA(2, 2)	35	0.3146902	69.993476	74.906234	0.707	63.993476	0.006543	6.729434	0.45088
☐	☐	ARIMA(2, 2, 1	34	0.3201438	71.479649	78.029994	0.710	63.479649	0.003112	6.623504	0.44304
☐	☐	ARIMA(1, 2, 2	34	0.322353	71.621826	78.172170	0.709	63.621826	0.002898	6.574306	0.43988
☐	☐	IMA(2, 1)	36	0.3462372	73.144329	76.419501	0.666	69.144329	0.001354	7.269068	0.48860
☐	☐	ARIMA(2, 2, 2	33	0.3338047	73.848008	82.035939	0.707	63.848008	0.000952	6.518784	0.43630
☐	☐	ARI(1, 2)	36	0.4242656	77.275100	80.550272	0.620	73.2751	0.000172	7.435369	0.49832
☐	☐	ARI(2, 2)	35	0.4140515	77.378642	82.291400	0.639	71.378642	0.000163	7.341211	0.49193
☐	☐	I(2)	37	0.4430033	77.887165	79.524751	0.592	75.887165	0.000126	8.006591	0.53325
☐	☐	MA(1)	38	0.4621934	85.423795	88.801554	0.561	81.423795	0.000003	8.315332	0.54413
☐	☐	ARIMA(0, 0, 0	39	1.0356318	115.90284	117.59172	0.000	113.90284	0.000000	12.169961	0.79365



Model: AR(2)

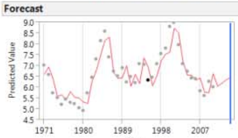
Model Summary

DF	37	Stable	Yes
Sum of Squared Errors	9.29603857	Invertible	Yes
Variance Estimate	0.25124429		
Standard Deviation	0.50124274		
Akaike's 'A' Information Criterion	62.7758208		
Schwarz's Bayesian Criterion	67.8424591		
RSquare	0.76614614		
RSquare Adj	0.75350539		
MAPE	6.29171958		
MAE	0.41536418		
-2LogLikelihood	56.7758208		

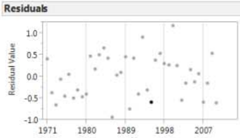
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.201331	0.1396864	8.60	<.0001*	1.51262005
AR2	2	-0.429876	0.1386290	-3.10	0.0037*	
Intercept	0	6.618474	0.3217547	20.57	<.0001*	

Forecast

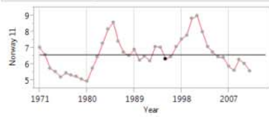


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	-0.0113	0.0055	0.9408	1	-0.0113
2	-0.0021	0.0057	0.9972	2	-0.0022
3	-0.0308	0.0488	0.9972	3	-0.0309
4	0.1568	1.1955	0.8788	4	0.1562
5	-0.0944	1.6234	0.8984	5	-0.0941
6	-0.1127	2.2513	0.8952	6	-0.1168
7	-0.0724	2.5184	0.9257	7	-0.0663
8	0.0536	2.6692	0.9534	8	0.0250
9	0.0102	2.6748	0.9758	9	0.0360
10	-0.2129	5.2134	0.8765	10	-0.2006
11	-0.1100	5.9143	0.8790	11	-0.1227
12	0.0806	6.3040	0.9000	12	0.0513
13	0.1228	7.2423	0.8892	13	0.1180
14	-0.2326	10.7387	0.7064	14	-0.1941
15	0.1548	12.3487	0.6525	15	0.1638
16	0.1588	14.1142	0.5902	16	0.1164
17	0.1059	14.9336	0.6003	17	0.0238
18	-0.0213	14.9682	0.6641	18	0.0756
19	-0.1184	16.0898	0.6513	19	-0.1826
20	-0.0344	16.1891	0.7048	20	-0.1131
21	-0.1300	17.6842	0.6689	21	-0.1977
22	0.0016	17.6844	0.7245	22	0.0823
23	-0.1624	20.2920	0.6242	23	-0.0544
24	-0.0462	20.5159	0.6671	24	-0.1649
25	-0.0565	20.8734	0.6996	25	-0.0731

Time Series Norway 11



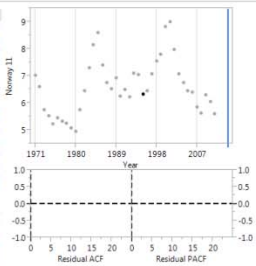
Mean	6.5912
Std	1.0047717
N	41
Zero Mean ADF	-0.637403
Single Mean ADF	-1.671493
Trend ADF	-1.649849

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8327	30.5599	<.0001*	1	0.8327
2	0.5771	45.6147	<.0001*	2	-0.3792
3	0.3422	51.0477	<.0001*	3	-0.0183
4	0.1308	51.8632	<.0001*	4	-0.1443
5	-0.0618	52.0504	<.0001*	5	-0.1358
6	-0.1796	53.6755	<.0001*	6	0.0659
7	-0.2340	56.5143	<.0001*	7	-0.0512
8	-0.2519	59.9046	<.0001*	8	-0.0373
9	-0.2787	64.1832	<.0001*	9	-0.1665
10	-0.2819	68.7020	<.0001*	10	0.0081
11	-0.1922	70.8718	<.0001*	11	0.2425
12	-0.0520	71.0359	<.0001*	12	0.0640
13	0.0532	71.2142	<.0001*	13	-0.0731
14	0.1317	72.3462	<.0001*	14	0.0158
15	0.2263	75.8184	<.0001*	15	0.1490
16	0.2450	80.0519	<.0001*	16	-0.1737
17	0.1612	81.9599	<.0001*	17	-0.1352
18	0.0247	82.0068	<.0001*	18	-0.1185
19	-0.1140	83.0488	<.0001*	19	-0.1264
20	-0.2385	87.8225	<.0001*	20	-0.0454
21	-0.3186	96.7698	<.0001*	21	0.0666
22	-0.3645	109.096	<.0001*	22	-0.0729
23	-0.3731	122.730	<.0001*	23	-0.1401
24	-0.3549	135.796	<.0001*	24	-0.0672
25	-0.3165	146.833	<.0001*	25	0.0739

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	38	0.2499894	64.067814	69.208531	0.766	58.067814	0.226000	6.336808	0.417209
☐	☐	ARMA(1, 2)	37	0.2547118	65.827821	72.682110	0.767	57.827821	0.093741	6.246951	0.411084
☐	☐	ARMA(1, 1)	38	0.2627273	65.959492	71.100208	0.754	59.959492	0.087768	6.527132	0.432770
☐	☐	ARMA(2, 1)	37	0.2566507	66.054122	72.908410	0.766	58.054122	0.083712	6.343713	0.417505
☐	☐	IMA(1, 1)	38	0.2916732	66.299822	69.677581	0.730	62.299822	0.074034	6.404339	0.429631
☐	☐	ARIMA(2, 1, 1	36	0.2638645	66.334214	73.089732	0.757	58.334214	0.072772	6.406026	0.423796
☐	☐	ARI(1, 1)	38	0.2937573	66.584379	69.962138	0.729	62.584379	0.064216	6.251719	0.419485
☐	☐	ARMA(2, 2)	36	0.2548933	66.903518	75.471378	0.773	56.903518	0.054745	6.164614	0.405136
☐	☐	ARIMA(1, 1, 2	36	0.2774436	67.763641	74.519159	0.747	59.763641	0.035610	6.520963	0.434408
☐	☐	ARI(2, 1)	37	0.2953518	67.773877	72.840515	0.734	61.773877	0.035428	6.374786	0.426990
☐	☐	MA(2)	38	0.2681765	67.907990	73.048706	0.743	61.90799	0.033130	6.653483	0.429884
☐	☐	IMA(1, 2)	37	0.2963565	67.915131	72.981770	0.733	61.915131	0.033012	6.251926	0.418580
☐	☐	ARIMA(1, 1, 1	37	0.2980353	68.113263	73.179902	0.732	62.113263	0.029899	6.331648	0.424306
☐	☐	ARIMA(2, 1, 2	35	0.271502	68.332337	76.776734	0.757	58.332337	0.026797	6.399830	0.423440
☐	☐	I(1)	39	0.3240245	69.424923	71.113803	0.693	67.424923	0.015518	6.859029	0.463875
☐	☐	AR(1)	39	0.3044624	70.749413	74.176557	0.709	66.749413	0.008002	7.116501	0.476167
☐	☐	IMA(2, 2)	36	0.3074533	70.790229	75.780914	0.712	64.790229	0.007841	6.666310	0.445424
☐	☐	ARIMA(1, 2, 1	36	0.3100007	70.819095	75.809780	0.712	64.819095	0.007728	6.530768	0.435534
☐	☐	ARIMA(2, 2, 1	35	0.3120595	72.247650	78.901897	0.716	64.24765	0.003783	6.572923	0.438531
☐	☐	ARIMA(1, 2, 2	35	0.314886	72.452163	79.106410	0.714	64.452163	0.003416	6.536416	0.436032
☐	☐	IMA(2, 1)	37	0.3408761	74.339735	77.666858	0.671	70.339735	0.001329	7.250879	0.485938
☐	☐	ARIMA(2, 2, 2	34	0.3281186	74.786414	83.104222	0.712	64.786414	0.001063	6.515163	0.434508
☐	☐	ARI(2, 2)	36	0.4046778	78.450543	83.441228	0.646	72.450543	0.000170	7.295311	0.487074
☐	☐	ARI(1, 2)	37	0.4179712	78.661004	81.988127	0.624	74.661004	0.000153	7.481486	0.498986
☐	☐	I(2)	38	0.4323933	78.965796	80.629358	0.601	76.965796	0.000132	7.900344	0.525165
☐	☐	MA(1)	39	0.4585331	87.179308	90.606452	0.564	83.179308	0.000002	8.322625	0.543806
☐	☐	ARIMA(0, 0, 0	40	1.0348054	118.74331	120.45688	-0.00	116.74331	0.000000	12.204650	0.794800



Model: AR(2)

Model Summary

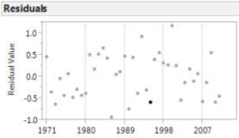
DF	38	Stable	Yes
Sum of Squared Errors	9.49959568	Invertible	Yes
Variance Estimate	0.24998936		
Standard Deviation	0.49998936		
Akaike's 'A' Information Criterion	64.0678143		
Schwarz's Bayesian Criterion	69.2085305		
RSquare	0.76612071		
RSquare Adj	0.75381127		
MAPE	6.33680767		
MAE	0.4172091		
-2LogLikelihood	58.0678143		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.212491	0.1389281	8.73	<.0001*	1.46689771
AR2	2	-0.435712	0.1381879	-3.15	0.0032*	
Intercept	0	6.571484	0.3251840	20.21	<.0001*	

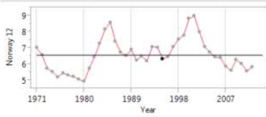
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0046	0.0009	0.9759	1	0.0046
2	-0.0370	0.0629	0.9690	2	-0.0371
3	-0.0274	0.0978	0.9921	3	-0.0271
4	0.1805	1.6501	0.7998	4	0.1797
5	-0.0931	2.0747	0.8387	5	-0.1008
6	-0.1031	2.6107	0.8559	6	-0.0925
7	-0.0746	2.8995	0.8941	7	-0.0703
8	0.0648	3.1237	0.9264	8	0.0253
9	0.0422	3.2218	0.9548	9	0.0705
10	-0.2120	5.7786	0.8335	10	-0.2022
11	-0.1579	7.2429	0.7791	11	-0.1557
12	0.0714	7.5527	0.8190	12	0.0358
13	0.1096	8.3095	0.8229	13	0.0860
14	-0.2559	12.5843	0.5595	14	-0.2075
15	0.1275	13.6861	0.5495	15	0.1765
16	0.1821	16.0255	0.4512	16	0.1272
17	0.1184	17.0557	0.4506	17	0.0297
18	-0.0630	17.3603	0.4985	18	0.0321
19	-0.1002	18.1647	0.5115	19	-0.1609
20	-0.0497	18.3725	0.5629	20	-0.1217
21	-0.0908	19.0995	0.5788	21	-0.1939
22	-0.0119	19.1126	0.6384	22	0.0503
23	-0.1626	21.7017	0.5383	23	-0.0643
24	-0.0460	21.9212	0.5840	24	-0.1564
25	-0.0057	21.9247	0.6401	25	-0.0484

Time Series Norway 12



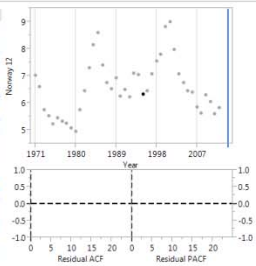
Mean	6.5727929
Std	0.9997103
N	42
Zero Mean ADF	-0.587777
Single Mean ADF	-1.742306
Trend ADF	-1.744713

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8391	31.7376	<.0001*	1	0.8391
2	0.5794	47.2448	<.0001*	2	-0.4217
3	0.3438	52.8459	<.0001*	3	0.0268
4	0.1480	53.9113	<.0001*	4	-0.1056
5	-0.0450	54.0124	<.0001*	5	-0.2154
6	-0.1705	55.5053	<.0001*	6	0.1204
7	-0.2241	58.1569	<.0001*	7	-0.0516
8	-0.2466	61.4632	<.0001*	8	-0.0902
9	-0.2787	65.8129	<.0001*	9	-0.1130
10	-0.2980	70.9414	<.0001*	10	-0.0556
11	-0.2284	74.0516	<.0001*	11	0.2520
12	-0.0878	74.5265	<.0001*	12	0.0990
13	0.0331	74.5965	<.0001*	13	-0.0835
14	0.1140	75.4539	<.0001*	14	0.0240
15	0.2146	78.6050	<.0001*	15	0.1661
16	0.2440	82.8362	<.0001*	16	-0.2740
17	0.1636	84.8139	<.0001*	17	-0.0901
18	0.0159	84.8335	<.0001*	18	-0.1148
19	-0.1221	86.0316	<.0001*	19	-0.1474
20	-0.2286	90.4202	<.0001*	20	0.0335
21	-0.3125	99.0134	<.0001*	21	-0.0830
22	-0.3533	110.548	<.0001*	22	0.0628
23	-0.3739	124.145	<.0001*	23	-0.2160
24	-0.3492	136.663	<.0001*	24	0.0429
25	-0.3151	147.458	<.0001*	25	-0.0055

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	39	0.2446306	64.587149	69.800158	0.769	58.587149	0.244284	6.265640	0.411596
☐	☐	ARMA(1, 1)	39	0.2564606	66.437241	71.650250	0.757	60.437241	0.096862	6.426767	0.425455
☐	☐	ARMA(1, 2)	38	0.2502252	66.502123	73.452802	0.769	58.502123	0.093770	6.212870	0.407734
☐	☐	ARMA(2, 1)	38	0.2509244	66.566058	73.516737	0.769	58.566058	0.090820	6.272469	0.411853
☐	☐	ARIMA(2, 1, 1	37	0.2573668	66.883196	73.737484	0.760	58.883196	0.077502	6.338465	0.418311
☐	☐	IMA(1, 1)	39	0.2871058	67.259318	70.686463	0.731	63.259318	0.064216	6.402528	0.427963
☐	☐	ARMA(2, 2)	37	0.2496376	67.475564	76.163912	0.775	57.475564	0.057635	6.112679	0.400760
☐	☐	ARI(1, 1)	39	0.2901564	67.683403	71.110547	0.729	63.683403	0.051946	6.287961	0.420107
☐	☐	ARIMA(1, 1, 2	37	0.2703963	68.333472	75.187761	0.750	60.333472	0.037531	6.458352	0.429180
☐	☐	MA(2)	39	0.2642957	68.556212	73.769221	0.746	62.556212	0.033576	6.624214	0.427559
☐	☐	ARI(2, 1)	38	0.2912472	68.815858	73.956574	0.734	62.815858	0.029488	6.392248	0.426692
☐	☐	ARIMA(2, 1, 2	36	0.2645327	68.883153	77.451014	0.760	58.883153	0.028512	6.337606	0.418261
☐	☐	IMA(1, 2)	38	0.2929746	69.050013	74.190729	0.733	63.050013	0.026230	6.315827	0.421397
☐	☐	ARIMA(1, 1, 1	38	0.2937832	69.148501	74.289217	0.732	63.148501	0.024969	6.354872	0.424378
☐	☐	I(1)	40	0.3174654	70.297717	72.011289	0.696	68.297717	0.014056	6.816845	0.459554
☐	☐	AR(1)	40	0.296985	71.349842	74.825182	0.713	67.349842	0.008306	6.974579	0.466329
☐	☐	IMA(2, 2)	37	0.3025981	71.839555	76.906194	0.713	65.839555	0.006502	6.658379	0.443441
☐	☐	ARIMA(1, 2, 1	37	0.3060253	72.024390	77.091028	0.712	66.02439	0.005928	6.519032	0.433329
☐	☐	ARIMA(2, 2, 1	36	0.3077692	73.426514	80.182032	0.716	65.426514	0.002941	6.598901	0.438842
☐	☐	ARIMA(1, 2, 2	36	0.3102673	73.606896	80.362413	0.715	65.606896	0.002687	6.565363	0.436583
☐	☐	IMA(2, 1)	38	0.3339857	75.310634	78.688393	0.673	71.310634	0.001146	7.197362	0.480892
☐	☐	ARIMA(2, 2, 2	35	0.323508	76.013178	84.457576	0.712	66.013178	0.000807	6.507856	0.432573
☐	☐	ARI(2, 2)	37	0.3969586	79.642590	84.709228	0.647	73.64259	0.000131	7.248716	0.482856
☐	☐	ARI(1, 2)	38	0.4164034	80.481477	83.859236	0.621	76.481477	0.000086	7.522998	0.499783
☐	☐	I(2)	39	0.4321637	80.944336	82.633215	0.596	78.944336	0.000069	7.960188	0.526982
☐	☐	MA(1)	40	0.4498543	88.440054	91.915393	0.567	84.440054	0.000002	8.239105	0.538230
☐	☐	ARIMA(0, 0, 0	41	1.0237968	121.16650	122.90417	-0.00	119.1665	0.000000	12.153722	0.791478



Model: AR(2)

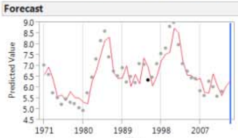
Model Summary

DF	39	Stable	Yes
Sum of Squared Errors	9.5405935	Invertible	Yes
Variance Estimate	0.2446306		
Standard Deviation	0.49460146		
Akaike's 'A' Information Criterion	64.5871495		
Schwarz's Bayesian Criterion	69.8001583		
RSquare	0.76872261		
RSquare Adj	0.75686223		
MAPE	6.26563954		
MAE	0.41159618		
-2LogLikelihood	58.5871495		

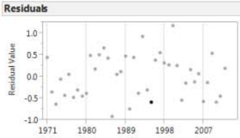
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.205123	0.1361848	8.85	<.0001*	1.49425605
AR2	2	-0.431865	0.1365583	-3.16	0.0030*	
Intercept	0	6.590111	0.3135661	21.02	<.0001*	

Forecast



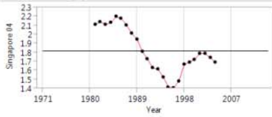
Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0037	0.0006	0.9801	1	0.0037
2	-0.0426	0.0845	0.9586	2	-0.0426
3	-0.0139	0.0937	0.9926	3	-0.0136
4	0.1772	1.6206	0.8051	4	0.1758
5	-0.1047	2.1686	0.8254	5	-0.1112
6	-0.1023	2.7061	0.8447	6	-0.0895
7	-0.0787	3.0331	0.8819	7	-0.0820
8	0.0645	3.2595	0.9170	8	0.0278
9	0.0355	3.3300	0.9498	9	0.0687
10	-0.2257	6.2713	0.7920	10	-0.2179
11	-0.1552	7.7074	0.7393	11	-0.1552
12	0.0910	8.2170	0.7680	12	0.0491
13	0.1125	9.0230	0.7712	13	0.0974
14	-0.2467	13.0395	0.5234	14	-0.1905
15	0.1402	14.3847	0.4966	15	0.1762
16	0.1897	16.9438	0.3892	16	0.1229
17	0.1067	17.7846	0.4026	17	0.0286
18	-0.0694	18.1551	0.4455	18	0.0224
19	-0.0806	18.6770	0.4777	19	-0.1414
20	-0.0597	18.9766	0.5233	20	-0.1363
21	-0.0830	19.5823	0.5478	21	-0.1862
22	-0.0309	19.6708	0.6036	22	0.0454
23	-0.1540	21.9769	0.5216	23	-0.0551
24	-0.0453	22.1874	0.5681	24	-0.1529
25	-0.0079	22.1942	0.6245	25	-0.0507

Singapore

Time Series Singapore 04



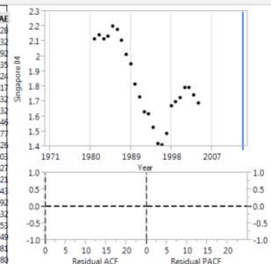
Mean	1.8202792
Std	0.2473156
N	24
Zero Mean ADF	-1.320545
Single Mean ADF	-1.090735
Trend ADF	-0.699895

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.9198	22.9515	<.0001*	1	0.9198
2	0.7861	40.4781	<.0001*	2	-0.3888
3	0.6351	52.4623	<.0001*	3	-0.0875
4	0.4648	59.2024	<.0001*	4	-0.2048
5	0.2621	61.4586	<.0001*	5	-0.3098
6	0.0644	61.6023	<.0001*	6	-0.0187
7	-0.0945	61.9301	<.0001*	7	0.0882
8	-0.2328	64.0433	<.0001*	8	-0.1365
9	-0.3490	69.1105	<.0001*	9	-0.0185
10	-0.4208	77.0045	<.0001*	10	0.0614
11	-0.4387	86.2425	<.0001*	11	0.0384
12	-0.4130	95.1104	<.0001*	12	0.0855
13	-0.3849	103.514	<.0001*	13	-0.2193
14	-0.3397	110.715	<.0001*	14	-0.0168
15	-0.2701	115.775	<.0001*	15	0.0286
16	-0.1909	118.618	<.0001*	16	-0.0229
17	-0.1336	120.209	<.0001*	17	-0.1114
18	-0.1093	121.453	<.0001*	18	-0.2133
19	-0.0811	122.273	<.0001*	19	0.0667
20	-0.0550	122.746	<.0001*	20	0.0380
21	-0.0488	123.241	<.0001*	21	-0.0363
22	-0.0439	123.841	<.0001*	22	0.1203
23	-0.0260	124.263	<.0001*	23	-0.0098
24	0.0000	.	.	24	-0.0289
25	0.0000	.	.	25	-0.1224

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	21	0.0038424	-59.28416	-55.74999	0.890	-65.28416	0.189519	3.248821	0.058728
☐	☐	ARI(1, 1)	21	0.0040314	-59.27386	-57.00287	0.938	-63.27386	0.188546	2.999669	0.052232
☐	☐	IMA(1, 1)	21	0.004293	-57.89864	-55.62765	0.934	-61.89864	0.094797	2.999220	0.052292
☐	☐	IMA(1, 2)	20	0.0041673	-57.53183	-54.12535	0.939	-63.53183	0.078911	2.997187	0.052335
☐	☐	ARIMA(1, 1, 1	20	0.0042032	-57.41906	-54.01258	0.939	-63.41906	0.074585	3.003754	0.052324
☐	☐	ARI(2, 1)	20	0.0042042	-57.41450	-54.00802	0.939	-63.4145	0.074415	3.003406	0.052317
☐	☐	ARMA(2, 1)	20	0.0040304	-57.30962	-52.59740	0.889	-65.30962	0.070613	3.253908	0.058832
☐	☐	ARMA(1, 2)	20	0.0040744	-56.88255	-52.17034	0.895	-64.88255	0.057036	3.210892	0.058132
☐	☐	ARMA(1, 1)	21	0.0044331	-56.16005	-52.62589	0.893	-62.16005	0.039743	3.350632	0.060346
☐	☐	ARIMA(1, 1, 2	19	0.0043677	-55.57809	-51.03611	0.939	-63.57809	0.029709	2.985576	0.052177
☐	☐	ARIMA(2, 1, 1	19	0.0044244	-55.41933	-50.87736	0.939	-63.41933	0.027442	3.003848	0.052326
☐	☐	ARMA(2, 2)	19	0.0042722	-54.90441	-49.01414	0.895	-64.90441	0.021213	3.196855	0.057903
☐	☐	ARIMA(2, 1, 2	18	0.0037409	-54.71212	-49.03465	0.943	-64.71212	0.019268	2.921361	0.051027
☐	☐	I(2)	21	0.0050615	-52.88422	-51.79318	0.916	-54.88422	0.007725	3.362760	0.058321
☐	☐	I(1)	22	0.0056675	-52.73034	-51.59485	0.910	-54.73034	0.007153	3.378384	0.058843
☐	☐	IMA(2, 1)	20	0.0051055	-51.70275	-49.52066	0.919	-55.70275	0.004279	3.370528	0.058392
☐	☐	ARI(1, 2)	20	0.0051982	-51.35053	-49.16844	0.918	-55.35053	0.003588	3.377081	0.058532
☐	☐	IMA(2, 2)	19	0.0051439	-50.56787	-47.29474	0.922	-56.56787	0.002426	3.280956	0.056853
☐	☐	ARI(2, 2)	19	0.0052078	-50.35088	-47.07775	0.921	-56.35088	0.002177	3.246265	0.056249
☐	☐	ARIMA(1, 2, 2	18	0.0046797	-50.07567	-45.71150	0.928	-58.07567	0.001897	3.225767	0.055981
☐	☐	AR(1)	22	0.0060985	-50.06786	-47.71175	0.872	-54.06786	0.001890	3.874084	0.068780
☐	☐	ARIMA(2, 2, 2	17	0.0045578	-48.93959	-43.48438	0.931	-58.93959	0.001075	3.153149	0.054861
☐	☐	ARIMA(1, 2, 1	19	0.0055919	-48.88920	-45.61607	0.916	-54.8892	0.001048	3.362552	0.058318
☐	☐	ARIMA(2, 2, 1	18	0.0054089	-48.66459	-44.30042	0.923	-56.66459	0.000937	3.259054	0.056484
☐	☐	MA(2)	21	0.0082694	-38.45834	-34.92418	0.814	-44.45834	0.000006	4.802514	0.087100
☐	☐	MA(1)	22	0.0187992	-22.13493	-19.77882	0.653	-26.13493	0.000000	6.738022	0.121448
☐	☐	ARIMA(0, 0, 0	23	0.0638244	3.048727	4.226781	0.000	1.048727	0.000000	11.972483	0.213982



Model: AR(2)

Model Summary

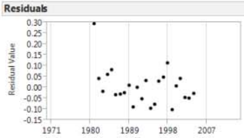
DF	21	Stable	Yes
Sum of Squared Errors	0.08069013	Invertible	Yes
Variance Estimate	0.00384239		
Standard Deviation	0.06198699		
Akaike's 'A' Information Criterion	-59.284156		
Schwarz's Bayesian Criterion	-55.749994		
RSquare	0.88960114		
RSquare Adj	0.87908696		
MAPE	3.24882144		
MAE	0.05872824		
-2LogLikelihood	-65.284156		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.534803	0.1505824	10.19	<.0001*	0.14448354
AR2	2	-0.614155	0.1546379	-3.97	0.0007*	
Intercept	0	1.820783	0.1307077	13.93	<.0001*	

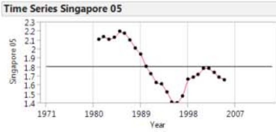
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0663	0.1194	0.7297	1	0.0663
2	-0.0664	0.2444	0.8850	2	-0.0711
3	0.0849	0.4586	0.9279	3	0.0952
4	0.2197	1.9653	0.7421	4	0.2054
5	-0.0151	1.9727	0.8529	5	-0.0329
6	-0.2182	3.6238	0.7274	6	-0.2075
7	-0.0418	3.6879	0.8149	7	-0.0600
8	0.0218	3.7064	0.8826	8	-0.0340
9	-0.0979	4.1048	0.9044	9	-0.0609
10	-0.1117	4.6611	0.9126	10	-0.0085
11	-0.1209	5.3629	0.9123	11	-0.1169
12	0.1078	5.9671	0.9177	12	0.0977
13	-0.0869	6.3951	0.9306	13	-0.0916
14	-0.1457	7.7205	0.9034	14	-0.1064
15	0.0136	7.7334	0.9340	15	0.0184
16	0.1654	9.8662	0.8735	16	0.1138
17	0.1790	12.7235	0.7545	17	0.2031
18	-0.2313	18.2854	0.4370	18	-0.2174
19	-0.0152	18.3141	0.5016	19	-0.0705
20	0.0522	18.7392	0.5388	20	-0.1338
21	-0.0974	20.7122	0.4766	21	-0.1540
22	-0.1024	23.9859	0.3480	22	0.0456
23	-0.0599	26.2277	0.2902	23	0.0349
24	0.0000	.	.	24	-0.0541
25	0.0000	.	.	25	0.0470

Time Series Singapore 05



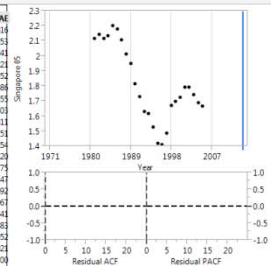
Mean	1.814024
Std	0.2442488
N	25
Zero Mean ADF	-1.393506
Single Mean ADF	-1.096827
Trend ADF	-0.781854

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.9177	23.6845	<.0001*	1	0.9177
2	0.7797	41.5279	<.0001*	2	-0.3951
3	0.6252	53.5188	<.0001*	3	-0.0791
4	0.4561	60.2056	<.0001*	4	-0.1738
5	0.2622	62.5265	<.0001*	5	-0.2621
6	0.0696	62.6986	<.0001*	6	-0.0644
7	-0.0851	62.9699	<.0001*	7	0.0926
8	-0.2018	64.5870	<.0001*	8	-0.0057
9	-0.3074	68.5747	<.0001*	9	-0.1728
10	-0.3772	74.9762	<.0001*	10	0.0882
11	-0.4043	82.8562	<.0001*	11	-0.0197
12	-0.3862	90.6003	<.0001*	12	0.0704
13	-0.3583	97.8219	<.0001*	13	-0.1173
14	-0.3222	104.192	<.0001*	14	-0.0279
15	-0.2606	108.776	<.0001*	15	0.0585
16	-0.1954	111.638	<.0001*	16	-0.1211
17	-0.1446	113.403	<.0001*	17	-0.0403
18	-0.1307	115.049	<.0001*	18	-0.2458
19	-0.1111	116.439	<.0001*	19	0.1647
20	-0.0890	117.508	<.0001*	20	-0.0898
21	-0.0772	118.514	<.0001*	21	0.0462
22	-0.0716	119.666	<.0001*	22	0.0297
23	-0.0578	120.792	<.0001*	23	-0.0086
24	-0.0302	121.407	<.0001*	24	0.0378
25	0.0000	.	.	25	-0.0474

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	22	0.0036652	-63.15727	-59.50064	0.891	-69.15727	0.200573	3.132184	0.056616
☐	☐	ARI(1, 1)	22	0.0038536	-63.03061	-60.67450	0.939	-67.03061	0.188264	2.904340	0.050553
☐	☐	IMA(1, 1)	22	0.0040981	-61.62202	-59.26591	0.935	-65.62202	0.093089	2.881818	0.050241
☐	☐	IMA(1, 2)	21	0.0039681	-61.33514	-57.80098	0.940	-67.33514	0.080650	2.876166	0.050221
☐	☐	ARIMA(1, 1, 1	21	0.0040077	-61.18859	-57.65442	0.939	-67.18859	0.074951	2.902912	0.050552
☐	☐	ARMA(2, 1)	21	0.0038357	-61.18485	-56.30935	0.890	-69.18485	0.074811	3.135386	0.056686
☐	☐	ARI(2, 1)	21	0.0040088	-61.18254	-57.64838	0.939	-67.18254	0.074725	2.903152	0.050555
☐	☐	ARMA(1, 2)	21	0.0039159	-60.56919	-55.69369	0.893	-68.56919	0.054989	3.180397	0.057503
☐	☐	ARMA(1, 1)	22	0.0042389	-59.81069	-56.15407	0.892	-65.81069	0.037633	3.265342	0.058811
☐	☐	ARIMA(1, 1, 2	20	0.0041516	-59.38130	-54.66909	0.940	-67.3813	0.030362	2.870353	0.050151
☐	☐	ARIMA(2, 1, 1	20	0.004208	-59.18885	-54.47663	0.939	-67.18885	0.027577	2.903015	0.050554
☐	☐	ARMA(2, 2)	20	0.0041136	-58.57650	-52.48212	0.893	-68.5765	0.020303	3.176306	0.057420
☐	☐	ARIMA(2, 1, 2	19	0.003709	-57.72160	-51.83134	0.942	-67.7216	0.013241	2.913885	0.050775
☐	☐	I(2)	22	0.0048706	-56.21565	-55.08016	0.916	-58.21565	0.006236	3.297198	0.057147
☐	☐	I(1)	23	0.0054237	-56.11989	-54.94184	0.911	-58.11989	0.005945	3.255973	0.056692
☐	☐	IMA(2, 1)	21	0.0048894	-55.12474	-52.85375	0.920	-59.12474	0.003614	3.296028	0.057067
☐	☐	ARI(1, 2)	21	0.0049902	-54.70642	-52.43544	0.918	-58.70642	0.002932	3.316293	0.057441
☐	☐	IMA(2, 2)	20	0.0048892	-54.13950	-50.73302	0.923	-60.1395	0.002208	3.168057	0.054883
☐	☐	ARI(2, 2)	20	0.0049648	-53.85080	-50.44432	0.922	-59.8508	0.001912	3.155494	0.054652
☐	☐	ARIMA(1, 2, 2	19	0.0044324	-53.76438	-49.22241	0.929	-61.76438	0.001831	3.112859	0.054021
☐	☐	AR(1)	23	0.0058731	-53.21106	-50.77330	0.870	-57.21106	0.001388	3.812881	0.067700
☐	☐	ARIMA(2, 2, 2	18	0.0043024	-52.68174	-47.00427	0.931	-62.68174	0.001065	3.038516	0.052859
☐	☐	ARIMA(2, 2, 1	19	0.0051285	-52.23802	-47.69604	0.923	-60.23802	0.000853	3.152602	0.054626
☐	☐	ARIMA(1, 2, 1	20	0.0053576	-52.21565	-48.80917	0.916	-58.21565	0.000844	3.297198	0.057147
☐	☐	MA(2)	22	0.0089862	-39.69972	-36.04309	0.803	-45.69972	0.000002	4.871037	0.088453
☐	☐	MA(1)	23	0.0182535	-23.96453	-21.52678	0.652	-27.96453	0.000000	6.603965	0.119161
☐	☐	ARIMA(0, 0, 0	24	0.0621432	2.468522	3.687398	0.000	0.4685219	0.000000	11.732511	0.209927



Model: AR(2)

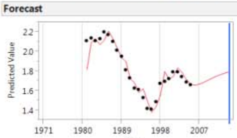
Model Summary

DF	22	Stable	Yes
Sum of Squared Errors	0.08063533	Invertible	Yes
Variance Estimate	0.00366524		
Standard Deviation	0.06054124		
Akaike's 'A' Information Criterion	-63.157269		
Schwarz's Bayesian Criterion	-59.500642		
RSquare	0.8906398		
RSquare Adj	0.88069796		
MAPE	3.13218357		
MAE	0.05661613		
-2LogLikelihood	-69.157269		

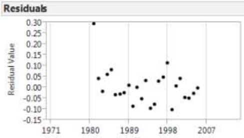
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.538571	0.1459397	10.54	<.0001*	0.14328018
AR2	2	-0.617342	0.1504529	-4.10	0.0005*	
Intercept	0	1.818951	0.1267447	14.35	<.0001*	

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0655	0.1207	0.7283	1	0.0655
2	-0.0657	0.2474	0.8837	2	-0.0703
3	0.0863	0.4759	0.9242	3	0.0964
4	0.2165	1.9830	0.7389	4	0.2023
5	-0.0164	1.9921	0.8502	5	-0.0335
6	-0.2127	3.5988	0.7308	6	-0.2021
7	-0.0470	3.6817	0.8156	7	-0.0669
8	0.0198	3.6973	0.8833	8	-0.0335
9	-0.0992	4.1122	0.9039	9	-0.0626
10	-0.1065	4.6228	0.9149	10	-0.0053
11	-0.1152	5.2622	0.9178	11	-0.1088
12	0.1070	5.8566	0.9231	12	0.0987
13	-0.0840	6.2538	0.9364	13	-0.0901
14	-0.1448	7.5411	0.9118	14	-0.1093
15	0.0194	7.5665	0.9400	15	0.0204
16	0.1655	9.6206	0.8857	16	0.1147
17	0.1808	12.3787	0.7767	17	0.2090
18	-0.2299	17.4732	0.4908	18	-0.2178
19	-0.0125	17.4908	0.5567	19	-0.0667
20	0.0490	17.8144	0.5996	20	-0.1400
21	-0.1000	19.5018	0.5530	21	-0.1537
22	-0.1008	21.7884	0.4726	22	0.0469
23	-0.0610	23.0450	0.4581	23	0.0348
24	-0.0141	23.1800	0.5092	24	-0.0577
25	0.0000	.	.	25	0.0465

Time Series Singapore 06

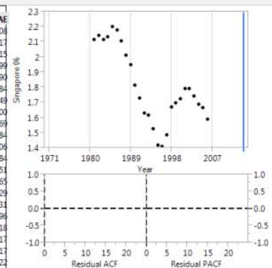
Mean	1.8053385
Std	0.243411
N	26
Zero Mean ADF	-1.572255
Single Mean ADF	-0.997089
Trend ADF	-0.947601

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.9087	24.0469	<.0001*	1	0.9087
2	0.7703	42.0450	<.0001*	2	-0.3185
3	0.6119	53.8945	<.0001*	3	-0.1382
4	0.4397	60.2929	<.0001*	4	-0.1502
5	0.2496	62.4527	<.0001*	5	-0.2115
6	0.0711	62.6367	<.0001*	6	-0.0369
7	-0.0755	62.8549	<.0001*	7	0.0216
8	-0.1856	64.2486	<.0001*	8	0.0148
9	-0.2606	67.1569	<.0001*	9	0.0107
10	-0.3152	71.6773	<.0001*	10	-0.1038
11	-0.3398	77.2801	<.0001*	11	-0.0079
12	-0.3352	83.1234	<.0001*	12	-0.0022
13	-0.3185	88.8035	<.0001*	13	-0.0739
14	-0.2828	93.6561	<.0001*	14	0.0582
15	-0.2345	97.2943	<.0001*	15	-0.0009
16	-0.1811	99.6807	<.0001*	16	-0.0236
17	-0.1503	101.508	<.0001*	17	-0.1644
18	-0.1459	103.446	<.0001*	18	-0.1680
19	-0.1411	105.518	<.0001*	19	0.0422
20	-0.1315	107.615	<.0001*	20	0.0356
21	-0.1254	109.904	<.0001*	21	0.0033
22	-0.1120	112.187	<.0001*	22	0.0876
23	-0.0973	114.485	<.0001*	23	-0.0862
24	-0.0756	116.564	<.0001*	24	-0.0367
25	-0.0435	117.940	<.0001*	25	0.0182

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARI(1, 1)	23	0.0038058	-66.05611	-63.61835	0.939	-70.05611	0.214937	2.907901	0.050408
☐	☐	AR(2)	23	0.0037041	-65.53690	-61.76261	0.880	-71.5369	0.165793	3.232788	0.058217
☐	☐	IMA(1, 1)	23	0.0040677	-64.46847	-62.03072	0.935	-68.46847	0.097176	2.894252	0.050215
☐	☐	IMA(1, 2)	22	0.0039363	-64.21961	-60.56298	0.939	-70.21961	0.085807	2.899963	0.050399
☐	☐	ARIMA(1, 1, 1	22	0.0039613	-64.15370	-60.49707	0.939	-70.1537	0.083025	2.917806	0.050590
☐	☐	ARI(2, 1)	22	0.0039627	-64.14628	-60.48965	0.939	-70.14628	0.082718	2.917600	0.050584
☐	☐	ARMA(2, 1)	22	0.0038523	-63.66730	-58.63492	0.879	-71.6673	0.065101	3.238844	0.058349
☐	☐	ARMA(1, 2)	22	0.0039672	-62.76971	-57.73732	0.881	-70.76971	0.041560	3.269819	0.058900
☐	☐	ARIMA(1, 1, 2	21	0.0040803	-62.37294	-57.49743	0.940	-70.37294	0.034082	2.871119	0.049969
☐	☐	ARIMA(2, 1, 1	21	0.0041498	-62.15461	-57.27911	0.939	-70.15461	0.030557	2.917504	0.050584
☐	☐	ARMA(1, 1)	23	0.0043115	-61.88207	-58.10778	0.881	-67.88207	0.026664	3.370505	0.060506
☐	☐	ARIMA(2, 1, 2	20	0.0035911	-61.12223	-55.02785	0.942	-71.12223	0.018236	2.890040	0.050184
☐	☐	ARMA(2, 2)	21	0.0041353	-60.82473	-54.53425	0.881	-70.82473	0.015716	3.271526	0.058951
☐	☐	I(2)	23	0.0047512	-59.29686	-58.11880	0.917	-61.29686	0.007321	3.275016	0.056565
☐	☐	I(1)	24	0.0053275	-58.94569	-57.72681	0.911	-60.94569	0.006142	3.254223	0.056429
☐	☐	ARIMA(1, 2, 1	21	0.0041722	-58.71023	-55.17607	0.928	-64.71023	0.005460	3.110989	0.053731
☐	☐	IMA(2, 1)	22	0.0047391	-58.34826	-55.99216	0.921	-62.34826	0.004556	3.249709	0.056096
☐	☐	ARI(1, 2)	22	0.004843	-57.88016	-55.52405	0.919	-61.88016	0.003605	3.279142	0.056618
☐	☐	IMA(2, 2)	21	0.0047778	-57.20061	-53.66645	0.923	-63.20061	0.002567	3.159042	0.054517
☐	☐	ARIMA(2, 2, 2	19	0.0038188	-57.18559	-51.29532	0.936	-67.18559	0.002547	2.750955	0.047517
☐	☐	ARI(2, 2)	21	0.0048098	-57.06622	-53.53206	0.923	-63.06622	0.002400	3.123630	0.053922
☐	☐	ARIMA(1, 2, 2	20	0.004369	-56.72402	-52.01180	0.929	-64.72402	0.002022	3.116666	0.053832
☐	☐	ARIMA(2, 2, 1	20	0.0049835	-55.35596	-50.64374	0.924	-63.35596	0.001020	3.120313	0.053864
☐	☐	AR(1)	24	0.0058986	-55.28664	-52.77045	0.862	-59.28664	0.000986	3.892363	0.068959
☐	☐	MA(2)	23	0.0081834	-42.41310	-38.63881	0.805	-48.4131	0.000002	4.801943	0.087148
☐	☐	MA(1)	24	0.0184026	-24.87729	-22.36110	0.645	-28.87729	0.000000	6.616459	0.119283
☐	☐	ARIMA(0, 0, 0	25	0.0616189	2.308594	3.566691	-0.00	0.3085941	0.000000	11.658380	0.208486



Model: ARI(1, 1)

Model Summary

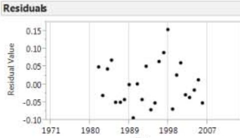
DF	23	Stable	Yes
Sum of Squared Errors	0.08753269	Invertible	Yes
Variance Estimate	0.00380577		
Standard Deviation	0.06169092		
Akaike's 'A' Information Criterion	-66.056106		
Schwarz's Bayesian Criterion	-63.618354		
RSquare	0.9387888		
RSquare Adj	0.93612745		
MAPE	2.90790123		
MAE	0.0504079		
-2LogLikelihood	-70.056106		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	0.5513813	0.1629680	3.38	0.0026*	-0.0095694
Intercept	0	-0.0213307	0.0251719	-0.85	0.4055	

Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0393	0.0434	0.8350	1	0.0393
2	-0.0335	0.0763	0.9625	2	-0.0351
3	-0.0017	0.0764	0.9945	3	0.0011
4	0.1331	0.6460	0.9578	4	0.1323
5	-0.0114	0.6504	0.9856	5	-0.0227
6	-0.3907	6.0743	0.4149	6	-0.3889
7	-0.0199	6.0891	0.5294	7	0.0122
8	-0.1805	7.3830	0.4959	8	-0.2421
9	-0.0412	7.4546	0.5899	9	-0.0339
10	-0.3445	12.7943	0.2354	10	-0.3241
11	-0.0666	13.0079	0.2928	11	-0.0895
12	0.1044	13.5733	0.3288	12	-0.0707
13	0.1105	14.2598	0.3558	13	0.1138
14	0.0328	14.3258	0.4257	14	-0.1101
15	-0.0340	14.4038	0.4951	15	-0.0468
16	0.2703	19.8848	0.2255	16	-0.0406
17	-0.0167	19.9084	0.2789	17	-0.1525
18	-0.0235	19.9616	0.3350	18	-0.1844
19	0.0353	20.1019	0.3885	19	0.0468
20	0.0274	20.2032	0.4453	20	-0.2100
21	-0.0470	20.5765	0.4851	21	-0.1112
22	-0.0389	20.9175	0.5258	22	0.0452
23	0.0253	21.1330	0.5730	23	-0.0295
24	-0.0282	21.6698	0.5990	24	-0.0510
25	0.0000	.	.	25	-0.0271

Time Series Singapore 07

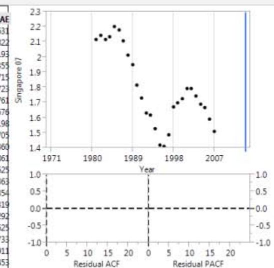
Mean	1.7942704
Std	0.2454375
N	27
Zero Mean ADF	-1.752147
Single Mean ADF	-0.836369
Trend ADF	-1.03831

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8984	24.3069	<.0001*	1	0.8984
2	0.7525	42.0418	<.0001*	2	-0.2832
3	0.5964	53.6460	<.0001*	3	-0.0940
4	0.4222	59.7133	<.0001*	4	-0.1905
5	0.2310	61.6117	<.0001*	5	-0.1910
6	0.0590	61.7413	<.0001*	6	-0.0182
7	-0.0694	61.9298	<.0001*	7	0.0632
8	-0.1692	63.1094	<.0001*	8	-0.0354
9	-0.2363	65.5383	<.0001*	9	0.0129
10	-0.2530	68.4857	<.0001*	10	0.0861
11	-0.2597	71.7864	<.0001*	11	-0.1539
12	-0.2529	75.1247	<.0001*	12	-0.0113
13	-0.2535	78.7177	<.0001*	13	-0.1602
14	-0.2322	81.9654	<.0001*	14	0.0787
15	-0.1850	84.1997	<.0001*	15	0.1257
16	-0.1488	85.7762	<.0001*	16	-0.0724
17	-0.1327	87.1553	<.0001*	17	-0.1123
18	-0.1531	89.1944	<.0001*	18	-0.2686
19	-0.1603	91.7090	<.0001*	19	0.0788
20	-0.1691	94.9082	<.0001*	20	-0.0439
21	-0.1787	99.0733	<.0001*	21	0.0852
22	-0.1727	103.743	<.0001*	22	0.0469
23	-0.1486	108.063	<.0001*	23	0.0542
24	-0.1260	112.207	<.0001*	24	-0.1248
25	-0.1018	116.261	<.0001*	25	-0.0832

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARI(1, 1)	24	0.0036806	-69.63541	-67.11922	0.941	-73.63541	0.225817	2.872622	0.049631
☐	☐	AR(2)	24	0.0036208	-68.74405	-64.85654	0.877	-74.74405	0.144610	3.278630	0.058822
☐	☐	IMA(1, 1)	24	0.0039358	-67.97126	-65.45506	0.937	-71.97126	0.098263	2.845843	0.049193
☐	☐	IMA(1, 2)	23	0.0037865	-67.87654	-64.10225	0.942	-73.87654	0.093718	2.847325	0.049355
☐	☐	ARIMA(1, 1, 1	23	0.0038188	-67.77054	-63.99625	0.942	-73.77054	0.088880	2.876318	0.049715
☐	☐	ARI(2, 1)	23	0.003821	-67.75681	-63.98252	0.942	-73.75681	0.088272	2.877039	0.049723
☐	☐	ARMA(2, 1)	23	0.0037686	-66.80286	-61.61951	0.876	-74.80286	0.054787	3.274724	0.058761
☐	☐	ARMA(1, 2)	23	0.0038313	-66.13503	-60.95168	0.879	-74.13503	0.039233	3.259533	0.058576
☐	☐	ARIMA(1, 1, 2	22	0.0039165	-66.03673	-61.00435	0.942	-74.03673	0.037352	2.834890	0.049198
☐	☐	ARIMA(2, 1, 1	22	0.0039921	-65.77249	-60.74010	0.942	-73.77249	0.032729	2.875740	0.049705
☐	☐	ARIMA(2, 1, 2	21	0.003421	-65.08271	-58.79223	0.945	-75.08271	0.023182	2.786071	0.048360
☐	☐	ARMA(1, 1)	24	0.0042289	-64.84484	-60.95733	0.877	-70.84484	0.020582	3.403716	0.060861
☐	☐	ARMA(2, 2)	22	0.0039845	-64.19122	-57.71204	0.879	-74.19122	0.014844	3.261465	0.058625
☐	☐	I(2)	24	0.0045534	-62.87079	-61.65191	0.921	-64.87079	0.007671	3.148140	0.054363
☐	☐	ARIMA(1, 2, 1	22	0.0040076	-62.34652	-58.68990	0.932	-68.34652	0.005902	3.038358	0.052354
☐	☐	IMA(2, 1)	23	0.0045408	-61.93038	-59.49263	0.925	-65.93038	0.004793	3.151301	0.054319
☐	☐	I(1)	25	0.005256	-61.69319	-60.43509	0.914	-63.69319	0.004257	3.265958	0.056292
☐	☐	ARI(1, 2)	23	0.0046362	-61.46075	-59.02300	0.923	-65.46075	0.003790	3.166848	0.054625
☐	☐	IMA(2, 2)	22	0.0045662	-60.83373	-57.17710	0.927	-66.83373	0.002770	3.059170	0.052733
☐	☐	ARI(2, 2)	22	0.0045917	-60.71538	-57.05875	0.927	-66.71538	0.002611	3.008555	0.051911
☐	☐	ARIMA(1, 2, 2	21	0.0041842	-60.36746	-55.49196	0.932	-68.36746	0.002194	3.043731	0.052453
☐	☐	ARIMA(2, 2, 2	20	0.003778	-60.36212	-54.26774	0.938	-70.36212	0.002188	2.780633	0.047854
☐	☐	ARIMA(2, 2, 1	21	0.0047476	-59.01474	-54.13923	0.928	-67.01474	0.001116	3.008397	0.051899
☐	☐	AR(1)	25	0.0059605	-57.14528	-54.55360	0.854	-61.14528	0.000438	3.997216	0.070487
☐	☐	MA(2)	24	0.0084097	-43.68111	-39.79360	0.803	-49.68111	0.000001	4.864988	0.088003
☐	☐	MA(1)	25	0.0185895	-25.72232	-23.13065	0.645	-29.72232	0.000000	6.653192	0.119530
☐	☐	ARIMA(0, 0, 0	26	0.0625565	2.768181	4.064018	0.000	0.7681811	0.000000	11.729000	0.208963



Model: ARI(1, 1)

Model Summary

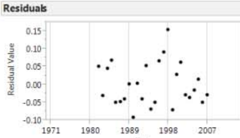
DF	24	Stable	Yes
Sum of Squared Errors	0.08833403	Invertible	Yes
Variance Estimate	0.00368058		
Standard Deviation	0.06066782		
Akaike's 'A' Information Criterion	-69.635413		
Schwarz's Bayesian Criterion	-67.11922		
RSquare	0.9413685		
RSquare Adj	0.93892552		
MAPE	2.87262232		
MAE	0.04963091		
-2LogLikelihood	-73.635413		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	0.5638811	0.1586816	3.55	0.0016*	-0.0103482
Intercept	0	-0.0237279	0.0249991	-0.95	0.3520	

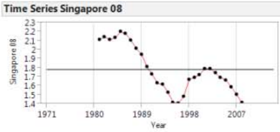
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0425	0.0527	0.8184	1	0.0425
2	-0.0436	0.1103	0.9463	2	-0.0455
3	0.0008	0.1104	0.9906	3	0.0047
4	0.1436	0.7924	0.9395	4	0.1419
5	0.0015	0.7924	0.9775	5	-0.0112
6	-0.4055	6.7786	0.3418	6	-0.4030
7	-0.0203	6.7945	0.4506	7	0.0172
8	-0.1511	7.7173	0.4616	8	-0.2194
9	-0.0814	8.0008	0.5341	9	-0.0857
10	-0.3694	14.2086	0.1637	10	-0.3410
11	-0.0843	14.5532	0.2039	11	-0.1137
12	0.1184	15.2827	0.2263	12	-0.0843
13	0.1311	16.2459	0.2361	13	0.1561
14	0.0155	16.2604	0.2977	14	-0.1033
15	-0.0233	16.2964	0.3626	15	-0.0542
16	0.2685	21.5438	0.1585	16	-0.0596
17	0.0067	21.5474	0.2028	17	-0.1652
18	-0.0253	21.6058	0.2500	18	-0.2023
19	0.0481	21.8468	0.2919	19	0.0479
20	0.0419	22.0593	0.3373	20	-0.2402
21	-0.0308	22.1974	0.3882	21	-0.1122
22	-0.0600	22.8520	0.4101	22	0.0250
23	0.0115	22.8838	0.4676	23	0.0012
24	-0.0192	23.0177	0.5188	24	-0.0685
25	-0.0160	23.2034	0.5657	25	-0.0148

Time Series Singapore 08



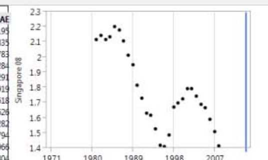
Mean	1.7806893
Std	0.2511338
N	28
Zero Mean ADF	-1.936111
Single Mean ADF	-0.597613
Trend ADF	-1.060681

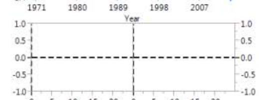
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8869	24.4699	<.0001*	1	0.8869
2	0.7343	41.8918	<.0001*	2	-0.2445
3	0.5733	52.9345	<.0001*	3	-0.1014
4	0.4054	58.6879	<.0001*	4	-0.1298
5	0.2155	60.3847	<.0001*	5	-0.2250
6	0.0442	60.4592	<.0001*	6	-0.0330
7	-0.0770	60.6963	<.0001*	7	0.0760
8	-0.1561	61.7192	<.0001*	8	0.0245
9	-0.2122	63.7101	<.0001*	9	-0.0369
10	-0.2221	66.0124	<.0001*	10	0.0863
11	-0.1868	67.7370	<.0001*	11	0.0612
12	-0.1607	69.0928	<.0001*	12	-0.1625
13	-0.1585	70.5004	<.0001*	13	-0.1412
14	-0.1579	71.9961	<.0001*	14	-0.0407
15	-0.1286	73.0650	<.0001*	15	0.1151
16	-0.0940	73.6829	<.0001*	16	0.0764
17	-0.0969	74.3997	<.0001*	17	-0.1315
18	-0.1326	75.8775	<.0001*	18	-0.1943
19	-0.1684	78.5244	<.0001*	19	-0.0939
20	-0.1907	82.3432	<.0001*	20	0.0410
21	-0.2212	88.2153	<.0001*	21	-0.0351
22	-0.2338	95.8663	<.0001*	22	0.0608
23	-0.2191	103.930	<.0001*	23	0.0412
24	-0.1861	111.200	<.0001*	24	0.0194
25	-0.1613	118.489	<.0001*	25	-0.0726

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARI(1, 1)	25	0.003579	-73.12908	-70.53741	0.945	-77.12908	0.252589	2.861942	0.049195
☐	☐	AR(2)	25	0.0035706	-71.69954	-67.70292	0.874	-77.69954	0.123593	3.354389	0.059835
☐	☐	IMA(1, 2)	24	0.0036743	-71.38498	-67.49747	0.946	-77.38498	0.105606	2.829323	0.048783
☐	☐	ARIMA(1, 1, 1	24	0.0037123	-71.23383	-67.34632	0.945	-77.23383	0.097919	2.866991	0.049284
☐	☐	ARI(2, 1)	24	0.0037134	-71.22677	-67.33926	0.945	-77.22677	0.097574	2.867405	0.049291
☐	☐	IMA(1, 1)	25	0.0038914	-70.97454	-68.38287	0.941	-74.97454	0.086013	2.854874	0.048919
☐	☐	ARMA(2, 1)	24	0.0037067	-69.77981	-64.45099	0.873	-77.77981	0.047329	3.341488	0.059618
☐	☐	ARIMA(1, 1, 2	23	0.0038062	-69.50480	-64.32145	0.946	-77.5048	0.041249	2.818918	0.048626
☐	☐	ARIMA(2, 1, 1	23	0.0038737	-69.23439	-64.05105	0.945	-77.23439	0.036032	2.866859	0.049282
☐	☐	ARMA(1, 2)	24	0.0038018	-68.93781	-63.60899	0.875	-76.93781	0.031066	3.348900	0.059794
☐	☐	ARIMA(2, 1, 2	22	0.0039598	-67.54606	-61.06688	0.946	-77.54606	0.015491	2.838558	0.048966
☐	☐	ARMA(2, 2)	23	0.0039666	-66.93796	-60.27694	0.875	-76.93796	0.011430	3.349469	0.059804
☐	☐	ARMA(1, 1)	25	0.0042835	-66.90190	-62.90529	0.869	-72.9019	0.011225	3.538457	0.062755
☐	☐	I(2)	25	0.0043728	-66.47581	-65.21772	0.927	-68.47581	0.009071	3.042344	0.052483
☐	☐	ARIMA(1, 2, 1	23	0.0038628	-65.97774	-62.20345	0.937	-71.97774	0.007072	2.974189	0.051069
☐	☐	IMA(2, 1)	24	0.0043561	-65.56516	-63.04897	0.931	-69.56516	0.005753	3.054303	0.052563
☐	☐	ARI(1, 2)	24	0.004445	-65.08829	-62.57210	0.929	-69.08829	0.004533	3.060489	0.052732
☐	☐	IMA(2, 2)	23	0.0043823	-64.45538	-60.68109	0.933	-70.45538	0.003303	2.981608	0.051256
☐	☐	ARI(2, 2)	23	0.0044056	-64.33483	-60.56054	0.933	-70.33483	0.003110	2.936173	0.050521
☐	☐	I(1)	26	0.0052309	-64.23215	-62.93632	0.918	-66.23215	0.002954	3.306242	0.056483
☐	☐	ARIMA(2, 2, 2	21	0.0035981	-64.23136	-57.94088	0.942	-74.23136	0.002953	2.708366	0.046481
☐	☐	ARIMA(1, 2, 2	22	0.0040301	-63.98786	-58.95547	0.937	-71.98786	0.002615	2.979383	0.051157
☐	☐	ARIMA(2, 2, 1	22	0.0045453	-62.64893	-57.61654	0.933	-70.64893	0.001339	2.935008	0.050493
☐	☐	AR(1)	26	0.0060885	-58.63550	-55.97109	0.847	-62.6355	0.000180	4.144123	0.072492
☐	☐	MA(2)	25	0.009929	-43.25373	-39.25711	0.797	-49.25373	0.000000	5.184377	0.092596
☐	☐	MA(1)	26	0.019855	-24.98750	-22.32309	0.638	-28.9875	0.000000	6.847237	0.121795
☐	☐	ARIMA(0, 0, 0	27	0.065404	4.081473	5.413677	-0.00	2.0814728	0.000000	12.050812	0.212802





Model: ARI(1, 1)

Model Summary

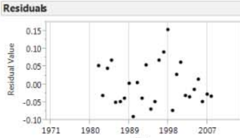
DF	25	Stable	Yes
Sum of Squared Errors	0.08947459	Invertible	Yes
Variance Estimate	0.00357898		
Standard Deviation	0.05982461		
Akaike's 'A' Information Criterion	-73.129082		
Schwarz's Bayesian Criterion	-70.537408		
RSquare	0.94522213		
RSquare Adj	0.94303102		
MAPE	2.86194217		
MAE	0.04919535		
-2LogLikelihood	-77.129082		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	0.5790683	0.1546156	3.75	0.0010*	-0.0111797
Intercept	0	-0.0265595	0.0250729	-1.06	0.2996	

Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0368	0.0408	0.8400	1	0.0368
2	-0.0318	0.0724	0.9644	2	-0.0332
3	-0.0077	0.0743	0.9947	3	-0.0053
4	0.1468	0.8080	0.9374	4	0.1466
5	0.0184	0.8200	0.9757	5	0.0069
6	-0.3868	6.3974	0.3802	6	-0.3883
7	-0.0323	6.4381	0.4896	7	0.0012
8	-0.1533	7.4069	0.4934	8	-0.2084
9	-0.0408	7.4792	0.5874	9	-0.0516
10	-0.4186	15.5481	0.1133	10	-0.3938
11	-0.1127	16.1693	0.1350	11	-0.1275
12	0.0903	16.5945	0.1655	12	-0.1034
13	0.1453	17.7759	0.1662	13	0.1544
14	0.0403	17.8739	0.2126	14	-0.0451
15	-0.0469	18.0172	0.2618	15	-0.0326
16	0.2803	23.6115	0.0983	16	-0.0515
17	-0.0042	23.6128	0.1303	17	-0.1878
18	0.0051	23.6151	0.1680	18	-0.2136
19	0.0456	23.8187	0.2032	19	0.0549
20	0.0537	24.1410	0.2363	20	-0.2271
21	-0.0138	24.1657	0.2851	21	-0.1345
22	-0.0397	24.4120	0.3260	22	0.0455
23	-0.0125	24.4427	0.3796	23	0.0082
24	-0.0376	24.8113	0.4161	24	-0.0038
25	-0.0045	24.8191	0.4725	25	-0.0132

Time Series Singapore 09

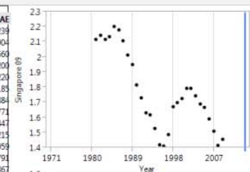
Mean	1.7694345
Std	0.2538507
N	29
Zero Mean ADF	-1.841413
Single Mean ADF	-0.831583
Trend ADF	-1.117422

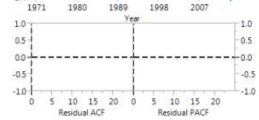
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.9000	26.0082	<.0001*	1	0.9000
2	0.7397	44.2267	<.0001*	2	-0.3703
3	0.5728	55.5724	<.0001*	3	-0.0377
4	0.4000	61.3251	<.0001*	4	-0.1531
5	0.2140	63.0412	<.0001*	5	-0.1870
6	0.0410	63.1069	<.0001*	6	-0.0397
7	-0.0837	63.3931	<.0001*	7	0.0863
8	-0.1603	64.4933	<.0001*	8	0.0291
9	-0.2027	66.3394	<.0001*	9	0.0034
10	-0.2067	68.3616	<.0001*	10	0.0608
11	-0.1686	69.7816	<.0001*	11	0.0652
12	-0.1099	70.4200	<.0001*	12	-0.0189
13	-0.0919	70.8945	<.0001*	13	-0.2914
14	-0.0888	71.3675	<.0001*	14	0.0250
15	-0.0761	71.7398	<.0001*	15	0.0418
16	-0.0551	71.9499	<.0001*	16	0.0635
17	-0.0576	72.1981	<.0001*	17	-0.0628
18	-0.1071	73.1361	<.0001*	18	-0.2221
19	-0.1550	75.2965	<.0001*	19	0.0313
20	-0.2001	79.2953	<.0001*	20	-0.1225
21	-0.2409	85.8186	<.0001*	21	0.0117
22	-0.2705	95.2164	<.0001*	22	0.0205
23	-0.2711	106.226	<.0001*	23	0.0398
24	-0.2457	117.083	<.0001*	24	-0.0200
25	-0.2124	127.218	<.0001*	25	0.0165

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARI(1, 1)	26	0.0038493	-73.96130	-71.29689	0.942	-77.9613	0.193598	3.023333	0.051239
☐	☐	AR(2)	26	0.0037009	-73.77471	-69.67283	0.890	-79.77471	0.176354	3.348966	0.058904
☐	☐	IMA(1, 2)	25	0.0038814	-72.62961	-68.63299	0.944	-78.62961	0.099478	2.969956	0.050560
☐	☐	IMA(1, 1)	26	0.0040621	-72.52014	-69.85573	0.939	-76.52014	0.094180	3.022221	0.051200
☐	☐	ARI(2, 1)	25	0.0039772	-72.12401	-68.12739	0.943	-78.12401	0.077257	3.021042	0.051220
☐	☐	ARIMA(1, 1, 1	25	0.0039787	-72.11592	-68.11930	0.943	-78.11592	0.076945	3.019185	0.051185
☐	☐	ARMA(2, 1)	25	0.0038393	-71.83918	-66.36999	0.889	-79.83918	0.067002	3.347366	0.058884
☐	☐	ARMA(1, 2)	25	0.0038416	-71.57015	-66.10097	0.890	-79.57015	0.058569	3.330034	0.058771
☐	☐	ARIMA(1, 1, 2	24	0.0040019	-70.85826	-65.52945	0.944	-78.85826	0.041028	2.961988	0.050447
☐	☐	ARIMA(2, 1, 1	24	0.0041429	-70.12414	-64.79533	0.943	-78.12414	0.028423	3.020719	0.051215
☐	☐	ARMA(1, 1)	26	0.0043078	-69.59076	-65.48887	0.884	-75.59076	0.021770	3.531259	0.061959
☐	☐	ARMA(2, 2)	24	0.0040011	-69.57121	-62.73473	0.890	-79.57121	0.021558	3.331190	0.058791
☐	☐	ARIMA(2, 1, 2	23	0.0040921	-69.18825	-62.52722	0.945	-79.18825	0.017801	2.979207	0.050867
☐	☐	I(1)	27	0.0051937	-66.84623	-65.51403	0.920	-68.84623	0.005519	3.362657	0.057000
☐	☐	ARIMA(1, 2, 1	24	0.0041739	-66.40229	-62.51478	0.933	-72.40229	0.004421	3.198825	0.054082
☐	☐	I(2)	26	0.0049038	-65.97567	-64.67983	0.920	-67.97567	0.003571	3.311669	0.056193
☐	☐	ARIMA(2, 2, 2	22	0.00371	-65.74567	-59.26649	0.941	-75.74567	0.003183	2.864615	0.048629
☐	☐	IMA(2, 1)	25	0.0048703	-65.12858	-62.53690	0.923	-69.12858	0.002338	3.329897	0.056393
☐	☐	ARI(1, 2)	25	0.0049797	-64.59326	-62.00158	0.922	-68.59326	0.001789	3.350485	0.056802
☐	☐	ARIMA(2, 2, 1	23	0.0043308	-64.46207	-59.27872	0.933	-72.46207	0.001676	3.211655	0.054321
☐	☐	IMA(2, 2)	24	0.0048653	-64.13932	-60.25181	0.926	-70.13932	0.001426	3.239388	0.054768
☐	☐	ARI(2, 2)	24	0.0049567	-63.72787	-59.84036	0.925	-69.72787	0.001161	3.201312	0.054170
☐	☐	ARIMA(1, 2, 2	23	0.0050544	-62.04784	-56.86449	0.926	-70.04784	0.000501	3.234251	0.054793
☐	☐	AR(1)	27	0.005906	-61.83579	-59.10119	0.859	-65.83579	0.000451	4.059920	0.070730
☐	☐	MA(2)	26	0.0094464	-46.14182	-42.03993	0.807	-52.14182	0.000000	5.000279	0.089330
☐	☐	MA(1)	27	0.0195087	-26.54271	-23.80811	0.650	-30.54271	0.000000	6.788766	0.120410
☐	☐	ARIMA(0, 0, 0	28	0.0667416	4.779925	6.147221	0.000	2.7799247	0.000000	12.221760	0.214778





Model: ARI(1, 1)

Model Summary

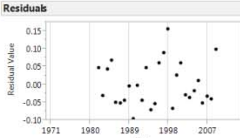
DF	26	Stable	Yes
Sum of Squared Errors	0.10008295	Invertible	Yes
Variance Estimate	0.00384934		
Standard Deviation	0.06204308		
Akaike's 'A' Information Criterion	-73.961299		
Schwarz's Bayesian Criterion	-71.29689		
RSquare	0.94233549		
RSquare Adj	0.94011763		
MAPE	3.02333334		
MAE	0.05123924		
-2LogLikelihood	-77.961299		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	0.5295116	0.1586042	3.34	0.0025*	-0.0090826
Intercept	0	-0.0193046	0.0232389	-0.83	0.4137	

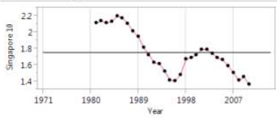
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0433	0.0582	0.8093	1	0.0433
2	-0.0332	0.0939	0.9541	2	-0.0352
3	-0.0469	0.1679	0.9826	3	-0.0441
4	0.1448	0.9014	0.9244	4	0.1483
5	-0.0095	0.9046	0.9699	5	-0.0268
6	-0.3881	6.6547	0.3540	6	-0.3903
7	-0.0902	6.9803	0.4309	7	-0.0481
8	-0.0958	7.3659	0.4977	8	-0.1382
9	-0.0429	7.4473	0.5907	9	-0.0979
10	-0.4562	17.1604	0.0709	10	-0.4445
11	0.0388	17.2346	0.1011	11	0.0367
12	0.1717	18.7815	0.0939	12	0.0023
13	0.2004	21.0303	0.0723	13	0.1279
14	-0.0093	21.0354	0.1007	14	-0.0341
15	-0.1004	21.6872	0.1163	15	-0.2067
16	0.3014	28.0449	0.0312*	16	-0.0347
17	-0.0213	28.0794	0.0440*	17	-0.1715
18	0.0180	28.1065	0.0605	18	-0.0520
19	-0.0477	28.3189	0.0775	19	0.0493
20	0.0537	28.6212	0.0955	20	-0.1848
21	-0.0505	28.9276	0.1158	21	-0.0879
22	-0.0861	29.9650	0.1193	22	0.1014
23	-0.0668	30.7148	0.1300	23	-0.0298
24	0.0359	30.9852	0.1542	24	0.0033
25	0.0400	31.4324	0.1751	25	-0.1752

Time Series Singapore 10



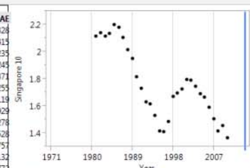
Mean	1.7558833
Std	0.2600338
N	30
Zero Mean ADF	-2.014308
Single Mean ADF	-0.59056
Trend ADF	-1.139593

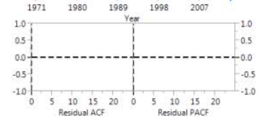
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8899	26.2157	<.0001*	1	0.8899
2	0.7498	45.4923	<.0001*	2	-0.2024
3	0.5775	57.3517	<.0001*	3	-0.2239
4	0.4012	63.2937	<.0001*	4	-0.1017
5	0.2129	65.0349	<.0001*	5	-0.1728
6	0.0461	65.1199	<.0001*	6	-0.0351
7	-0.0811	65.3945	<.0001*	7	0.0491
8	-0.1628	66.5514	<.0001*	8	0.0483
9	-0.2037	68.4489	<.0001*	9	0.0318
10	-0.1944	70.2628	<.0001*	10	0.0950
11	-0.1528	71.4426	<.0001*	11	0.0272
12	-0.0928	71.9015	<.0001*	12	-0.0060
13	-0.0372	71.9798	<.0001*	13	-0.0610
14	-0.0158	71.9949	<.0001*	14	-0.1893
15	-0.0009	71.9949	<.0001*	15	0.0110
16	0.0010	71.9950	<.0001*	16	0.0188
17	-0.0155	72.0128	<.0001*	17	-0.0283
18	-0.0623	72.3234	<.0001*	18	-0.0862
19	-0.1249	73.6852	<.0001*	19	-0.0783
20	-0.1830	76.9001	<.0001*	20	-0.0140
21	-0.2488	83.5014	<.0001*	21	-0.1146
22	-0.2899	93.5886	<.0001*	22	0.0393
23	-0.3105	106.815	<.0001*	23	-0.0157
24	-0.3035	121.555	<.0001*	24	0.0000
25	-0.2794	136.546	<.0001*	25	-0.0124

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARI(1, 1)	27	0.0040889	-74.99432	-72.25973	0.941	-78.99432	0.266289	3.136119	0.052328
☐	☐	IMA(1, 1)	27	0.0043437	-73.32309	-70.58849	0.938	-77.32309	0.115465	3.144249	0.052415
☐	☐	ARIMA(1, 1, 1	26	0.004242	-73.02334	-68.92145	0.941	-79.02334	0.099394	3.129333	0.052235
☐	☐	ARI(2, 1)	26	0.0042422	-73.02191	-68.92003	0.941	-79.02191	0.099323	3.130044	0.052245
☐	☐	IMA(1, 2)	26	0.0042363	-72.99765	-68.89576	0.941	-78.99765	0.098125	3.134407	0.052371
☐	☐	AR(2)	27	0.0042238	-72.48394	-68.28035	0.871	-78.48394	0.075898	3.650684	0.063255
☐	☐	ARMA(2, 1)	26	0.0042079	-71.67332	-66.06853	0.874	-79.67332	0.050607	3.576654	0.062119
☐	☐	ARIMA(1, 1, 2	25	0.0043148	-71.40241	-65.93323	0.942	-79.40241	0.044196	3.099625	0.051929
☐	☐	ARIMA(2, 1, 1	25	0.0044059	-71.05775	-65.58856	0.942	-79.05775	0.037199	3.130809	0.052278
☐	☐	ARIMA(2, 1, 2	24	0.0040258	-70.56992	-63.73344	0.945	-80.56992	0.029148	3.066248	0.051528
☐	☐	ARMA(1, 2)	26	0.0044464	-69.83585	-64.23106	0.868	-77.83585	0.020193	3.667027	0.063757
☐	☐	I(1)	28	0.005167	-69.41783	-68.05053	0.924	-71.41783	0.016384	3.401098	0.057132
☐	☐	ARMA(1, 1)	27	0.0048179	-68.68346	-64.47987	0.864	-74.68346	0.011349	3.856330	0.066772
☐	☐	ARMA(2, 2)	25	0.0044473	-68.30505	-61.29906	0.870	-78.30505	0.009393	3.666321	0.063993
☐	☐	ARIMA(1, 2, 1	25	0.0043978	-67.42026	-63.42365	0.932	-73.42026	0.006035	3.284066	0.054693
☐	☐	IMA(2, 1)	26	0.0049401	-67.12644	-64.46204	0.926	-71.12644	0.005210	3.364114	0.056245
☐	☐	I(2)	27	0.0053463	-66.03552	-64.70331	0.917	-68.03552	0.003020	3.498715	0.058233
☐	☐	ARI(1, 2)	26	0.0051701	-65.95412	-63.28971	0.922	-69.95412	0.002899	3.500139	0.058487
☐	☐	ARIMA(2, 2, 2	23	0.0040681	-65.89914	-59.23812	0.939	-75.89914	0.002821	3.031748	0.050473
☐	☐	IMA(2, 2)	25	0.0050309	-65.65754	-61.66093	0.927	-71.65754	0.002500	3.309078	0.055154
☐	☐	ARI(2, 2)	25	0.0051361	-65.14849	-61.15187	0.926	-71.14849	0.001938	3.325674	0.055466
☐	☐	ARIMA(2, 2, 1	24	0.0052362	-63.70258	-58.37376	0.927	-71.70258	0.000941	3.271477	0.054553
☐	☐	ARIMA(1, 2, 2	24	0.0052438	-63.55704	-58.22822	0.927	-71.55704	0.000875	3.315560	0.055344
☐	☐	AR(1)	28	0.0060158	-63.37853	-60.57614	0.853	-67.37853	0.000800	4.207532	0.072659
☐	☐	MA(2)	27	0.01173	-42.44307	-38.23948	0.785	-48.44307	0.000000	5.646151	0.098884
☐	☐	MA(1)	28	0.0220426	-23.94289	-21.14049	0.626	-27.94289	0.000000	7.196997	0.125840
☐	☐	ARIMA(0, 0, 0	29	0.0699492	6.319690	7.720887	-0.00	4.3196898	0.000000	12.557392	0.218460





Model: ARI(1, 1)

Model Summary

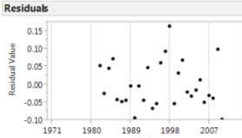
DF	27	Stable	Yes
Sum of Squared Errors	0.11040048	Invertible	Yes
Variance Estimate	0.00408891		
Standard Deviation	0.06394456		
Akaike's 'A' Information Criterion	-74.994323		
Schwarz's Bayesian Criterion	-72.259732		
RSquare	0.94142682		
RSquare Adj	0.93925744		
MAPE	3.13611853		
MAE	0.05232837		
-2LogLikelihood	-78.994323		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	0.4820138	0.1617726	2.98	0.0060*	-0.0136124
Intercept	0	-0.0262795	0.0214417	-1.23	0.2309	

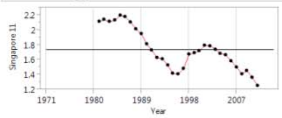
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	-0.0098	0.0031	0.9557	1	-0.0098
2	0.0283	0.0299	0.9852	2	0.0283
3	-0.0010	0.0299	0.9986	3	-0.0005
4	0.1656	1.0156	0.9074	4	0.1649
5	-0.0345	1.0601	0.9576	5	-0.0322
6	-0.3430	5.6595	0.4624	6	-0.3626
7	-0.0728	5.8758	0.5543	7	-0.0927
8	-0.0876	6.2043	0.6244	8	-0.0985
9	-0.1192	6.8428	0.6535	9	-0.1251
10	-0.4399	15.9978	0.0997	10	-0.3963
11	0.0802	16.3194	0.1297	11	0.0458
12	0.0079	16.3227	0.1769	12	-0.0879
13	0.0991	16.8744	0.2051	13	0.0569
14	-0.0493	17.0203	0.2551	14	-0.0175
15	-0.0237	17.0564	0.3155	15	-0.2240
16	0.3366	24.8895	0.0718	16	0.0670
17	-0.0575	25.1373	0.0917	17	-0.1570
18	0.0565	25.3985	0.1143	18	-0.0872
19	-0.0370	25.5216	0.1441	19	-0.1163
20	0.1242	27.0619	0.1335	20	-0.1620
21	-0.0470	27.3106	0.1608	21	-0.0793
22	-0.0414	27.5311	0.1917	22	-0.0011
23	-0.0166	27.5726	0.2324	23	-0.0085
24	0.0686	28.4195	0.2427	24	-0.0058
25	-0.0283	28.6000	0.2810	25	-0.1336

Time Series Singapore 11



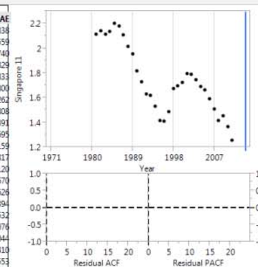
Mean	1.7397742
Std	0.2705947
N	31
Zero Mean ADF	-2.187243
Single Mean ADF	-0.259271
Trend ADF	-1.079972

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8791	26.3526	<.0001*	1	0.8791
2	0.7337	45.3442	<.0001*	2	-0.1719
3	0.5881	57.9814	<.0001*	3	-0.0756
4	0.4098	64.3439	<.0001*	4	-0.2418
5	0.2221	66.2848	<.0001*	5	-0.1503
6	0.0544	66.4061	<.0001*	6	-0.0620
7	-0.0670	66.5974	<.0001*	7	0.0714
8	-0.1531	67.6398	<.0001*	8	0.0245
9	-0.2016	69.5295	<.0001*	9	0.0383
10	-0.1945	71.3725	<.0001*	10	0.1029
11	-0.1426	72.4120	<.0001*	11	0.0923
12	-0.0813	72.7680	<.0001*	12	-0.0195
13	-0.0253	72.8045	<.0001*	13	-0.0676
14	0.0369	72.8865	<.0001*	14	0.0013
15	0.0711	73.2100	<.0001*	15	-0.1044
16	0.0761	73.6046	<.0001*	16	-0.0446
17	0.0412	73.7287	<.0001*	17	-0.1290
18	-0.0179	73.7540	<.0001*	18	-0.0612
19	-0.0756	74.2407	<.0001*	19	0.0390
20	-0.1482	76.2840	<.0001*	20	-0.0344
21	-0.2259	81.5050	<.0001*	21	-0.0536
22	-0.2938	91.3137	<.0001*	22	-0.0777
23	-0.3273	105.010	<.0001*	23	0.0300
24	-0.3428	122.188	<.0001*	24	-0.0474
25	-0.3392	141.803	<.0001*	25	-0.0288

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARI(1, 1)	28	0.004019	-78.14325	-75.34086	0.947	-82.14325	0.283619	3.136730	0.051838
☐	☐	IMA(1, 1)	28	0.0042298	-76.68809	-73.88570	0.944	-80.68809	0.137010	3.115877	0.051559
☐	☐	IMA(1, 2)	27	0.0041572	-76.15079	-71.94719	0.947	-82.15079	0.104731	3.126095	0.051740
☐	☐	ARIMA(1, 1, 1	27	0.0041669	-76.15016	-71.94657	0.947	-82.15016	0.104698	3.135622	0.051829
☐	☐	ARI(2, 1)	27	0.0041671	-76.14870	-71.94511	0.947	-82.1487	0.104622	3.136038	0.051833
☐	☐	AR(2)	28	0.004205	-74.98048	-70.67852	0.869	-80.98048	0.058338	3.770630	0.064800
☐	☐	ARIMA(1, 1, 2	26	0.0042683	-74.39595	-68.79116	0.947	-82.39595	0.043553	3.095352	0.051262
☐	☐	ARIMA(2, 1, 1	26	0.0043263	-74.15545	-68.55066	0.947	-82.15545	0.038619	3.134085	0.051808
☐	☐	ARMA(2, 1)	27	0.0042969	-73.39954	-67.66359	0.869	-81.39954	0.026464	3.749027	0.064391
☐	☐	ARIMA(2, 1, 2	25	0.0042313	-73.21095	-66.20497	0.949	-83.21095	0.024082	3.098384	0.051695
☐	☐	ARMA(1, 2)	27	0.0044402	-72.22200	-66.48605	0.865	-80.222	0.014688	3.782539	0.065159
☐	☐	I(1)	29	0.0052048	-71.62572	-70.22452	0.929	-73.62572	0.010901	3.489450	0.057817
☐	☐	ARMA(1, 1)	28	0.0047311	-71.50480	-67.20283	0.866	-77.5048	0.010262	3.905022	0.067120
☐	☐	ARIMA(1, 2, 1	26	0.0042796	-70.80278	-66.70089	0.939	-76.80278	0.007224	3.243559	0.053670
☐	☐	IMA(2, 1)	27	0.0048257	-70.28746	-67.55286	0.933	-74.28746	0.005583	3.355655	0.055626
☐	☐	ARMA(2, 2)	26	0.0045934	-70.28236	-63.11243	0.865	-80.28236	0.005569	3.795467	0.065394
☐	☐	I(2)	28	0.0051594	-69.46048	-68.09318	0.926	-71.46048	0.003692	3.403505	0.056532
☐	☐	ARIMA(2, 2, 2	24	0.0039618	-69.37291	-62.53643	0.945	-79.37291	0.003534	3.027188	0.050076
☐	☐	IMA(2, 2)	26	0.0048549	-69.12854	-65.02665	0.935	-75.12854	0.003128	3.257278	0.054044
☐	☐	ARI(1, 2)	27	0.0050525	-69.06743	-66.33284	0.930	-73.06743	0.003034	3.465097	0.057410
☐	☐	ARIMA(1, 2, 2	25	0.0044589	-68.83241	-63.36323	0.939	-76.83241	0.002697	3.237432	0.053553
☐	☐	ARI(2, 2)	26	0.0049494	-68.64003	-64.53815	0.934	-74.64003	0.002450	3.233402	0.053724
☐	☐	ARIMA(2, 2, 1	25	0.0050359	-67.22711	-61.75793	0.935	-75.22711	0.001209	3.192450	0.053064
☐	☐	AR(1)	29	0.0062184	-64.39875	-61.53077	0.848	-68.39875	0.000294	4.413713	0.075189
☐	☐	MA(2)	28	0.0116746	-43.81900	-39.51704	0.798	-49.819	0.000000	5.752036	0.099840
☐	☐	MA(1)	29	0.0226465	-24.04784	-21.17987	0.645	-28.04784	0.000000	7.398845	0.127679
☐	☐	ARIMA(0, 0, 0	30	0.0756622	8.931933	10.365920	0.000	6.9319332	0.000000	13.115534	0.224086



Model: ARI(1, 1)

Model Summary

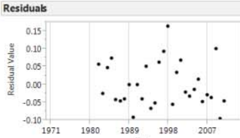
DF	28	Stable	Yes
Sum of Squared Errors	0.11253305	Invertible	Yes
Variance Estimate	0.00401904		
Standard Deviation	0.06339588		
Akaike's 'A' Information Criterion	-78.143254		
Schwarz's Bayesian Criterion	-75.340859		
RSquare	0.94667657		
RSquare Adj	0.94477216		
MAPE	3.13672971		
MAE	0.0518378		
-2LogLikelihood	-82.143254		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	0.5029278	0.1580729	3.18	0.0036*	-0.0145572
Intercept	0	-0.0292859	0.0217753	-1.34	0.1894	

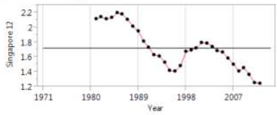
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0094	0.0029	0.9570	1	0.0094
2	-0.0227	0.0206	0.9897	2	-0.0228
3	0.0081	0.0230	0.9991	3	0.0086
4	0.1751	1.1556	0.8854	4	0.1746
5	-0.0102	1.1596	0.9487	5	-0.0134
6	-0.3396	5.7726	0.4491	6	-0.3429
7	-0.0531	5.8902	0.5526	7	-0.0591
8	-0.0612	6.0537	0.6412	8	-0.0995
9	-0.0924	6.4443	0.6948	9	-0.0973
10	-0.4545	16.3593	0.0898	10	-0.4034
11	0.0781	16.6677	0.1181	11	0.0861
12	0.0339	16.7288	0.1601	12	-0.0820
13	0.0328	16.7897	0.2091	13	0.0197
14	-0.0898	17.2736	0.2419	14	-0.0656
15	-0.0558	17.4726	0.2914	15	-0.1939
16	0.3520	25.9706	0.0544	16	0.1007
17	-0.0405	26.0918	0.0728	17	-0.1026
18	0.0306	26.1665	0.0960	18	-0.0474
19	-0.0252	26.2220	0.1241	19	-0.1050
20	0.1196	27.5959	0.1193	20	-0.1801
21	-0.0128	27.6135	0.1515	21	-0.0263
22	-0.0418	27.8229	0.1816	22	0.0144
23	0.0002	27.8229	0.2226	23	-0.0300
24	0.0875	29.0470	0.2184	24	0.0391
25	-0.0094	29.0640	0.2613	25	-0.1253

Time Series Singapore 12



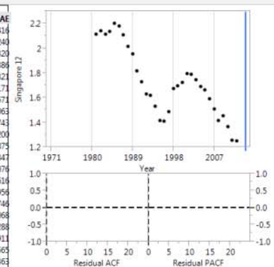
Mean	1.7244438
Std	0.2796766
N	32
Zero Mean ADF	-2.218254
Single Mean ADF	-0.343942
Trend ADF	-1.147269

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8895	27.7716	<.0001*	1	0.8895
2	0.7373	47.4859	<.0001*	2	-0.2587
3	0.5872	60.4239	<.0001*	3	-0.0418
4	0.4327	67.6979	<.0001*	4	-0.1290
5	0.2434	70.0854	<.0001*	5	-0.2794
6	0.0740	70.3146	<.0001*	6	0.0091
7	-0.0524	70.4339	<.0001*	7	0.0234
8	-0.1369	71.2835	<.0001*	8	0.0387
9	-0.1923	73.0328	<.0001*	9	0.0286
10	-0.1958	74.9292	<.0001*	10	0.1167
11	-0.1495	76.0870	<.0001*	11	0.0961
12	-0.0804	76.4382	<.0001*	12	0.0207
13	-0.0230	76.4685	<.0001*	13	-0.0808
14	0.0394	76.5626	<.0001*	14	0.0217
15	0.1093	77.3273	<.0001*	15	0.0381
16	0.1321	78.5141	<.0001*	16	-0.1885
17	0.1026	79.2776	<.0001*	17	-0.1039
18	0.0296	79.3458	<.0001*	18	-0.1826
19	-0.0385	79.4697	<.0001*	19	0.0472
20	-0.1063	80.4937	<.0001*	20	0.0566
21	-0.1959	84.2876	<.0001*	21	-0.0992
22	-0.2744	92.4794	<.0001*	22	0.0485
23	-0.3323	105.832	<.0001*	23	-0.0983
24	-0.3597	123.432	<.0001*	24	0.0164
25	-0.3759	145.390	<.0001*	25	-0.0809

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARI(1, 1)	29	0.0040041	-80.97318	-78.10521	0.950	-84.97318	0.258314	3.209416	0.052416
☐	☐	IMA(1, 1)	29	0.0041244	-80.08747	-77.21950	0.949	-84.08747	0.165889	3.118499	0.051240
☐	☐	ARIMA(1, 1, 1	28	0.0041414	-79.01079	-74.70883	0.950	-85.01079	0.096832	3.200935	0.052320
☐	☐	ARI(2, 1)	28	0.0041439	-78.99454	-74.69258	0.950	-84.99454	0.096048	3.206374	0.052386
☐	☐	IMA(1, 2)	28	0.0041659	-78.82258	-74.52062	0.950	-84.82258	0.088135	3.198742	0.052321
☐	☐	AR(2)	29	0.0041241	-78.38126	-73.98406	0.887	-84.38126	0.070684	3.709421	0.063171
☐	☐	ARIMA(2, 1, 1	27	0.0041581	-77.74479	-72.00884	0.952	-85.74479	0.051417	3.077781	0.050571
☐	☐	ARIMA(1, 1, 2	27	0.0042759	-77.13964	-71.40369	0.951	-85.13964	0.037993	3.180900	0.052063
☐	☐	ARMA(2, 1)	28	0.0041912	-76.90774	-71.04479	0.886	-84.90774	0.033834	3.680759	0.062743
☐	☐	ARIMA(2, 1, 2	26	0.0042899	-75.88660	-68.71667	0.952	-85.8866	0.020305	3.052692	0.050200
☐	☐	ARMA(2, 2)	27	0.0042482	-75.58858	-68.25990	0.887	-85.58858	0.017494	3.622033	0.061875
☐	☐	ARMA(1, 2)	28	0.0044213	-75.26591	-69.40296	0.886	-83.26591	0.014888	3.779342	0.064347
☐	☐	ARMA(1, 1)	29	0.0045663	-75.13734	-70.74013	0.879	-81.13734	0.013961	3.787727	0.065076
☐	☐	I(1)	30	0.0050459	-75.00655	-73.57256	0.935	-77.00655	0.013077	3.431802	0.056616
☐	☐	ARIMA(1, 2, 1	27	0.004293	-73.19543	-68.99184	0.942	-79.19543	0.005287	3.371410	0.054956
☐	☐	IMA(2, 1)	28	0.0048979	-72.29563	-69.49323	0.936	-76.29563	0.003372	3.478513	0.056746
☐	☐	ARIMA(2, 2, 2	25	0.003932	-72.01190	-65.00591	0.948	-82.0119	0.002926	3.055977	0.050068
☐	☐	IMA(2, 2)	27	0.004871	-71.39939	-67.19580	0.939	-77.39939	0.002154	3.381785	0.055288
☐	☐	ARI(2, 2)	27	0.0049002	-71.32956	-67.12597	0.938	-77.32956	0.002080	3.280229	0.053911
☐	☐	I(2)	29	0.0053399	-70.85734	-69.45614	0.928	-72.85734	0.001643	3.594780	0.058565
☐	☐	ARI(1, 2)	28	0.0052218	-70.52227	-67.71987	0.932	-74.52227	0.001389	3.649072	0.059363
☐	☐	ARIMA(1, 2, 2	26	0.0049396	-69.90529	-64.30050	0.940	-77.90529	0.001020	3.251432	0.053526
☐	☐	ARIMA(2, 2, 1	26	0.0050202	-69.70491	-64.10012	0.939	-77.70491	0.000923	3.228303	0.052976
☐	☐	AR(1)	30	0.0060077	-67.67813	-64.74666	0.860	-71.67813	0.000335	4.323268	0.073529
☐	☐	MA(2)	29	0.0119577	-44.72968	-40.33248	0.806	-50.72968	0.000000	5.657067	0.097320
☐	☐	MA(1)	30	0.0246872	-22.20377	-19.27230	0.639	-26.20377	0.000000	7.781627	0.131986
☐	☐	ARIMA(0, 0, 0	31	0.0807422	11.268307	12.734042	0.000	9.2683065	0.000000	13.660862	0.229815



Model: ARI(1, 1)

Model Summary

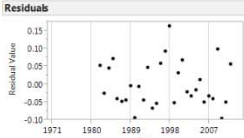
DF	29	Stable	Yes
Sum of Squared Errors	0.11611922	Invertible	Yes
Variance Estimate	0.00400411		
Standard Deviation	0.06327805		
Akaike's 'A' Information Criterion	-80.973185		
Schwarz's Bayesian Criterion	-78.10521		
RSquare	0.95024997		
RSquare Adj	0.94853446		
MAPE	3.20941605		
MAE	0.05241556		
-2LogLikelihood	-84.973185		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	0.4732047	0.1552711	3.05	0.0049*	-0.0136063
Intercept	0	-0.0258284	0.0203220	-1.27	0.2138	

Forecast

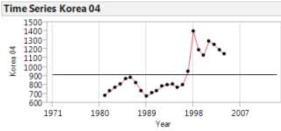
Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0151	0.0077	0.9299	1	0.0151
2	-0.0570	0.1222	0.9407	2	-0.0572
3	0.0665	0.2837	0.9631	3	0.0685
4	0.1504	1.1404	0.8878	4	0.1459
5	-0.0299	1.1755	0.9472	5	-0.0273
6	-0.3569	6.3880	0.3812	6	-0.3555
7	-0.0612	6.5478	0.4774	7	-0.0911
8	-0.0823	6.8493	0.5530	8	-0.1409
9	-0.1268	7.5970	0.5752	9	-0.0884
10	-0.4579	17.8108	0.0582	10	-0.4379
11	0.0915	18.2395	0.0762	11	0.0800
12	0.0441	18.3442	0.1056	12	-0.1361
13	0.0003	18.3442	0.1449	13	0.0453
14	-0.0025	18.3446	0.1915	14	-0.0600
15	0.0018	18.3448	0.2450	15	-0.1415
16	0.3717	27.7673	0.0337*	16	0.0766
17	-0.0497	27.9475	0.0456*	17	-0.1322
18	0.0022	27.9479	0.0629	18	-0.1230
19	0.0086	27.9541	0.0843	19	-0.1711
20	0.0989	28.8632	0.0905	20	-0.2044
21	-0.0076	28.8691	0.1172	21	-0.0090
22	-0.0838	29.6664	0.1268	22	-0.0461
23	0.0004	29.6664	0.1592	23	-0.0464
24	0.0624	30.2351	0.1771	24	0.0611
25	-0.0339	30.4316	0.2085	25	-0.1669

South Korea

Time Series Korea 04



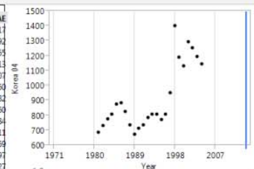
Mean	915.42618
Std	214.86237
N	24
Zero Mean ADF	0.4618218
Single Mean ADF	-1.325751
Trend ADF	-2.111897

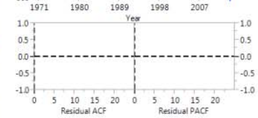
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8013	17.4205	<.0001*	1	0.8013
2	0.6073	27.8813	<.0001*	2	-0.0973
3	0.4888	34.9821	<.0001*	3	0.0926
4	0.3382	38.5498	<.0001*	4	-0.1757
5	0.2213	40.1583	<.0001*	5	0.0232
6	0.1038	40.5319	<.0001*	6	-0.1391
7	-0.0539	40.6388	<.0001*	7	-0.1827
8	-0.1403	41.4068	<.0001*	8	0.0380
9	-0.2154	43.3368	<.0001*	9	-0.1205
10	-0.2404	45.9124	<.0001*	10	0.1147
11	-0.2339	48.5374	<.0001*	11	-0.0493
12	-0.2186	51.0213	<.0001*	12	0.0599
13	-0.2101	53.5254	<.0001*	13	-0.0832
14	-0.2084	56.2342	<.0001*	14	-0.0712
15	-0.2121	59.3522	<.0001*	15	-0.0652
16	-0.2273	63.3818	<.0001*	16	-0.1491
17	-0.2487	68.8945	<.0001*	17	-0.0523
18	-0.1895	72.6281	<.0001*	18	0.1451
19	-0.1848	76.8924	<.0001*	19	-0.1583
20	-0.1905	82.5543	<.0001*	20	0.0410
21	-0.1440	86.8700	<.0001*	21	0.0215
22	-0.0953	89.7051	<.0001*	22	0.0527
23	-0.0476	91.1172	<.0001*	23	-0.0202
24	0.0000	.	.	24	-0.0757
25	0.0000	.	.	25	-0.0504

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	IMA(2, 1)	20	16284.999	280.82794	283.01002	0.656	276.82794	0.386051	7.977133	82.888617
☐	☐	IMA(2, 2)	19	17133.49	282.82762	286.10075	0.656	276.82762	0.142043	7.983624	82.926492
☐	☐	ARIMA(1, 2, 1	19	17138.46	282.82779	286.10091	0.656	276.82779	0.142031	7.980267	82.907165
☐	☐	ARIMA(2, 2, 1	18	16371.748	283.25444	287.61861	0.686	275.25444	0.114746	7.249262	74.489813
☐	☐	ARIMA(1, 2, 2	18	17596.583	284.14128	288.50545	0.666	276.14128	0.073648	7.396702	76.708807
☐	☐	ARIMA(2, 2, 2	17	17356.726	285.14063	290.59584	0.687	275.14063	0.044684	7.171454	73.211160
☐	☐	ARI(2, 2)	19	22112.118	285.97350	289.24663	0.586	279.9735	0.029465	7.969561	80.293282
☐	☐	I(1)	22	14804.532	287.11062	288.24612	0.691	285.11062	0.016687	7.261942	75.414660
☐	☐	ARIMA(1, 1, 1	20	13407.249	288.32410	291.73058	0.732	282.3241	0.009096	7.429946	72.470184
☐	☐	IMA(1, 2)	20	14440.326	288.64011	292.04660	0.726	282.64011	0.007767	6.994320	70.016011
☐	☐	ARI(2, 1)	20	14714.011	288.95426	292.36074	0.720	282.95426	0.006638	6.857902	69.181969
☐	☐	IMA(1, 1)	21	15426.55	288.99827	291.26926	0.692	284.99827	0.006494	7.266697	75.001997
☐	☐	ARI(1, 1)	21	15476.126	289.06307	291.33406	0.691	285.06307	0.006286	7.282873	75.435927
☐	☐	ARIMA(1, 1, 2	19	13446.474	289.60672	294.14869	0.743	281.60672	0.004790	7.533755	73.059406
☐	☐	ARI(1, 2)	20	28815.274	290.39233	292.57442	0.432	286.39233	0.003234	9.206631	98.033131
☐	☐	ARIMA(2, 1, 1	19	15470.938	290.92978	295.47175	0.721	282.92978	0.002472	6.755651	68.139350
☐	☐	ARIMA(2, 1, 2	18	14001.998	291.16312	296.84059	0.747	281.16312	0.002200	7.266813	70.521693
☐	☐	I(2)	21	32184.761	291.75332	292.84436	0.333	289.75332	0.001638	9.217796	99.250086
☐	☐	AR(1)	22	14696.99	301.56616	303.92227	0.674	297.56616	0.000012	7.043494	68.288393
☐	☐	ARMA(1, 1)	21	15245.764	303.34584	306.88000	0.678	297.34584	0.000005	7.034322	68.635710
☐	☐	AR(2)	21	15318.878	303.44648	306.98064	0.676	297.44648	0.000005	6.921293	67.231118
☐	☐	ARMA(1, 2)	20	15420.051	304.57640	309.28862	0.686	296.5764	0.000003	7.174943	69.573106
☐	☐	ARMA(2, 1)	20	15492.868	304.65688	309.36909	0.686	296.65688	0.000003	7.104329	69.146468
☐	☐	ARMA(2, 2)	19	16093.412	306.38954	312.27981	0.688	296.38954	0.000001	7.135463	68.959220
☐	☐	MA(2)	21	19410.207	308.92973	312.46389	0.607	302.92973	0.000000	10.404071	99.535915
☐	☐	MA(1)	22	22911.517	311.82412	314.18023	0.526	307.82412	0.000000	12.367126	115.99638
☐	☐	ARIMA(0, 0, 0	23	48173.049	327.86894	329.04699	-0.00	325.86894	0.000000	19.929227	185.88043





Model: IMA(2, 1)

Model Summary

DF	20	Stable	Yes
Sum of Squared Errors	325699.985	Invertible	Yes
Variance Estimate	16284.9993		
Standard Deviation	127.612692		
Akaike's 'A' Information Criterion	280.827938		
Schwarz's Bayesian Criterion	283.010023		
RSquare	0.65620952		
RSquare Adj	0.63902		
MAPE	7.9771331		
MAE	82.8886169		
-2LogLikelihood	276.827938		

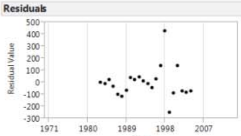
Failed: Cannot Decrease Objective Function Hessian is not positive definite.

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
MA1	1	0.99999907	0.1330827	7.51	<.0001*	0.00542403
Intercept	0	0.00542403	.	.	.	

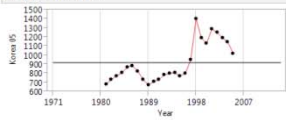
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	-0.0353	0.0313	0.8595	1	-0.0353
2	-0.2847	2.1711	0.3377	2	-0.2863
3	0.0782	2.3410	0.5047	3	0.0602
4	0.0376	2.3825	0.6658	4	-0.0424
5	-0.0357	2.4221	0.7882	5	0.0040
6	-0.0749	2.6073	0.8563	6	-0.0892
7	-0.0044	2.6080	0.9187	7	-0.0185
8	0.0081	2.6105	0.9564	8	-0.0392
9	-0.1421	3.4311	0.9447	9	-0.1550
10	-0.1487	4.4040	0.9273	10	-0.1880
11	-0.0346	4.4613	0.9544	11	-0.1606
12	0.0170	4.4765	0.9732	12	-0.1037
13	0.0277	4.5215	0.9843	13	-0.0415
14	-0.0328	4.5923	0.9907	14	-0.0869
15	0.0469	4.7586	0.9940	15	-0.0036
16	0.0619	5.0959	0.9953	16	-0.0202
17	0.0157	5.1219	0.9974	17	-0.0025
18	0.0021	5.1225	0.9987	18	-0.0460
19	-0.0032	5.1244	0.9993	19	-0.0831
20	0.0015	5.1250	0.9997	20	-0.1047
21	-0.0003	5.1250	0.9998	21	-0.0960
22	0.0000	.	.	22	-0.0694
23	0.0000	.	.	23	-0.0600
24	0.0000	.	.	24	-0.0399
25	0.0000	.	.	25	-0.0214

Time Series Korea 05



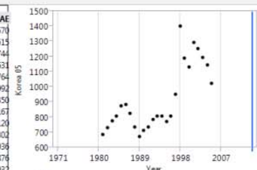
Mean	919.7591
Std	211.58872
N	25
Zero Mean ADF	0.2006682
Single Mean ADF	-1.561426
Trend ADF	-1.993003

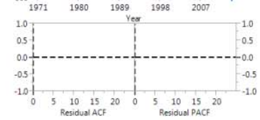
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8146	18.6623	<.0001*	1	0.8146
2	0.6272	30.2078	<.0001*	2	-0.1080
3	0.5161	38.3805	<.0001*	3	0.1142
4	0.3718	42.8246	<.0001*	4	-0.1859
5	0.2418	44.7986	<.0001*	5	-0.0124
6	0.1319	45.4170	<.0001*	6	-0.0879
7	-0.0032	45.4174	<.0001*	7	-0.1512
8	-0.1308	46.0967	<.0001*	8	-0.1026
9	-0.2203	48.1432	<.0001*	9	-0.0536
10	-0.2494	50.9411	<.0001*	10	0.0801
11	-0.2408	53.7376	<.0001*	11	0.0447
12	-0.2268	56.4073	<.0001*	12	0.0049
13	-0.2213	59.1617	<.0001*	13	-0.0585
14	-0.2251	62.2720	<.0001*	14	-0.0803
15	-0.2326	65.9237	<.0001*	15	-0.0870
16	-0.2524	70.7032	<.0001*	16	-0.1403
17	-0.2686	76.7893	<.0001*	17	-0.0869
18	-0.1999	80.6439	<.0001*	18	0.1991
19	-0.1890	84.6626	<.0001*	19	-0.1691
20	-0.1951	89.8003	<.0001*	20	0.0614
21	-0.1541	93.8052	<.0001*	21	0.0036
22	-0.1080	96.4318	<.0001*	22	0.0493
23	-0.0645	97.8371	<.0001*	23	-0.0098
24	-0.0217	98.1553	<.0001*	24	-0.0898
25	0.0000	.	.	25	-0.0684

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	IMA(2, 1)	21	16313.758	293.45145	295.72244	0.642	289.45145	0.398810	8.042214	83.285570
☐	☐	IMA(2, 2)	20	17174.44	295.42226	298.82874	0.641	289.42226	0.148871	7.964440	82.736515
☐	☐	ARIMA(1, 2, 1	20	17156.371	295.43507	298.84155	0.641	289.43507	0.147920	8.000931	83.009744
☐	☐	ARIMA(2, 2, 1	19	16916.301	296.41472	300.95670	0.662	288.41472	0.090636	7.658318	78.624631
☐	☐	ARIMA(1, 2, 2	19	16258.856	297.01565	301.55762	0.657	289.01565	0.067114	7.673917	79.226764
☐	☐	ARI(2, 2)	20	21218.924	297.88042	301.28690	0.585	291.88042	0.043554	7.851993	79.203992
☐	☐	ARIMA(2, 2, 2	18	17587.706	297.96546	303.64293	0.668	287.96546	0.041741	7.487614	76.270450
☐	☐	I(1)	23	14994.538	299.85821	301.03626	0.675	297.85821	0.016202	7.563693	78.166167
☐	☐	ARIMA(1, 1, 1	21	13759.731	301.28416	304.81832	0.714	295.28416	0.007942	7.190220	71.323120
☐	☐	IMA(1, 1)	22	15666.454	301.84458	304.20069	0.676	297.84458	0.006001	7.583784	78.227302
☐	☐	ARI(1, 1)	22	15671.508	301.85145	304.20756	0.675	297.85145	0.005980	7.575689	78.218036
☐	☐	IMA(1, 2)	21	15040.394	301.96253	305.49669	0.703	295.96253	0.005657	7.116521	72.436876
☐	☐	ARI(2, 1)	21	15311.059	302.30420	305.83836	0.697	296.3042	0.004769	7.117601	72.621032
☐	☐	ARIMA(1, 1, 2	20	13678.588	302.41229	307.12450	0.728	294.41229	0.004518	7.349077	72.515099
☐	☐	ARI(1, 2)	21	27629.518	302.53857	304.80956	0.432	298.53857	0.004242	9.076605	96.480653
☐	☐	ARIMA(2, 1, 1	20	15865.042	304.02170	308.73391	0.701	296.0217	0.002021	6.839584	69.623592
☐	☐	ARIMA(2, 1, 2	19	14267.326	304.04322	309.93349	0.731	294.04322	0.001999	7.149777	70.777006
☐	☐	I(2)	22	30937.471	304.06242	305.19791	0.334	302.06242	0.001980	9.097604	97.863798
☐	☐	AR(1)	23	14405.822	313.42202	315.85978	0.675	309.42202	0.000018	6.963948	67.929546
☐	☐	ARMA(1, 1)	22	14820.22	315.06593	318.72255	0.680	309.06593	0.000008	7.058978	69.572415
☐	☐	AR(2)	22	14922.791	315.21146	318.86809	0.678	309.21146	0.000008	6.950743	68.249324
☐	☐	ARMA(2, 1)	21	15085.9	316.42004	321.29555	0.688	308.42004	0.000004	7.105064	69.799306
☐	☐	ARMA(1, 2)	21	15077.574	316.42039	321.29589	0.687	308.42039	0.000004	7.139000	69.923160
☐	☐	ARMA(2, 2)	20	15713.371	318.24270	324.33708	0.690	308.2427	0.000002	7.100623	69.375211
☐	☐	MA(2)	22	18524.894	320.48758	324.14420	0.611	314.48758	0.000001	9.988235	95.597396
☐	☐	MA(1)	23	21911.616	323.59570	326.03345	0.531	319.5957	0.000000	11.908534	111.67604
☐	☐	ARIMA(0, 0, 0	24	46635.194	340.67915	341.89802	0.000	338.67915	0.000000	19.780388	183.99135





Model: IMA(2, 1)

Model Summary

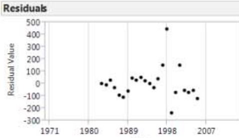
DF	21	Stable	Yes
Sum of Squared Errors	342588.908	Invertible	Yes
Variance Estimate	16313.7575		
Standard Deviation	127.725321		
Akaike's 'A' Information Criterion	293.451449		
Schwarz's Bayesian Criterion	295.722437		
RSquare	0.64159546		
RSquare Adj	0.62452858		
MAPE	8.04221422		
MAE	83.2855703		
-2LogLikelihood	289.451449		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
MA1	1	1.000000	0.139782	7.15	<.0001*	-1.4097348
Intercept	0	-1.409735	3.594006	-0.39	0.6988	

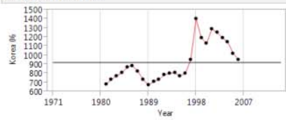
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	-0.0067	0.0012	0.9726	1	-0.0067
2	-0.2357	1.5220	0.4672	2	-0.2357
3	0.1081	1.8582	0.6024	3	0.1108
4	-0.0067	1.8596	0.7616	4	-0.0678
5	0.0024	1.8598	0.8682	5	0.0599
6	0.0301	1.8904	0.9295	6	-0.0015
7	-0.1512	2.7122	0.9103	7	-0.1394
8	-0.0464	2.7947	0.9466	8	-0.0419
9	-0.1523	3.7470	0.9273	9	-0.2474
10	-0.1338	4.5385	0.9198	10	-0.1345
11	-0.0372	4.6049	0.9488	11	-0.1664
12	0.0036	4.6056	0.9699	12	-0.0407
13	0.0007	4.6056	0.9829	13	-0.0379
14	-0.0516	4.7759	0.9887	14	-0.0936
15	0.0180	4.7992	0.9937	15	-0.0043
16	0.0729	5.2358	0.9945	16	-0.0438
17	0.0482	5.4582	0.9961	17	-0.0016
18	0.0328	5.5821	0.9976	18	-0.0623
19	0.0086	5.5927	0.9987	19	-0.0728
20	-0.0075	5.6035	0.9993	20	-0.0958
21	0.0037	5.6074	0.9997	21	-0.1016
22	0.0001	5.6074	0.9998	22	-0.0698
23	0.0000	.	.	23	-0.0758
24	0.0000	.	.	24	-0.0402
25	0.0000	.	.	25	-0.0297

Time Series Korea 06



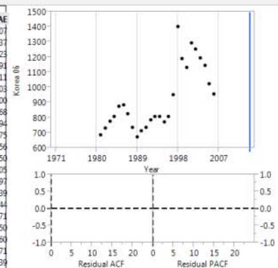
Mean	921.0884
Std	207.58624
N	26
Zero Mean ADF	0.0746299
Single Mean ADF	-1.648671
Trend ADF	-1.79554

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8167	19.4220	<.0001*	1	0.8167
2	0.6331	31.5820	<.0001*	2	-0.1015
3	0.5237	40.2629	<.0001*	3	0.1124
4	0.3816	45.0804	<.0001*	4	-0.1813
5	0.2533	47.3050	<.0001*	5	-0.0138
6	0.1389	48.0078	<.0001*	6	-0.1022
7	0.0060	48.0091	<.0001*	7	-0.1326
8	-0.1150	48.5437	<.0001*	8	-0.0932
9	-0.2178	50.5759	<.0001*	9	-0.1008
10	-0.2517	53.4583	<.0001*	10	0.1059
11	-0.2445	56.3605	<.0001*	11	0.0303
12	-0.2297	59.1054	<.0001*	12	0.0376
13	-0.2246	61.9301	<.0001*	13	-0.0745
14	-0.2294	65.1217	<.0001*	14	-0.0761
15	-0.2386	68.8903	<.0001*	15	-0.0943
16	-0.2596	73.7971	<.0001*	16	-0.1411
17	-0.2771	80.0066	<.0001*	17	-0.0870
18	-0.2064	83.8818	<.0001*	18	0.1987
19	-0.1925	87.7360	<.0001*	19	-0.1645
20	-0.1966	92.4279	<.0001*	20	0.0658
21	-0.1556	95.9547	<.0001*	21	0.0077
22	-0.1113	98.2105	<.0001*	22	0.0466
23	-0.0687	99.3541	<.0001*	23	-0.0169
24	-0.0271	99.6224	<.0001*	24	-0.0862
25	-0.0070	99.6577	<.0001*	25	-0.0723

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	IMA(2, 1)	22	15739.743	305.17431	307.53042	0.638	301.17431	0.394742	7.925572	81.694407
☐	☐	IMA(2, 2)	21	16525.114	307.08327	310.61743	0.638	301.08327	0.151981	7.757848	80.420237
☐	☐	ARIMA(1, 2, 1	21	16515.018	307.11989	310.65405	0.638	301.11989	0.149223	7.834607	81.045323
☐	☐	ARIMA(2, 2, 1	20	16394.058	308.21033	312.92255	0.656	300.21033	0.086507	7.636112	78.250791
☐	☐	ARIMA(1, 2, 2	20	16786.874	308.31535	313.02756	0.649	300.31535	0.082082	7.385034	76.149511
☐	☐	ARI(2, 2)	21	20237.561	309.56080	313.09496	0.584	303.5608	0.044035	7.680828	77.393103
☐	☐	ARIMA(2, 2, 2	19	16932.133	309.67677	315.56704	0.663	299.67677	0.041554	7.451588	75.780000
☐	☐	I(1)	24	14648.642	311.72895	312.94783	0.669	309.72895	0.014893	7.625542	78.359468
☐	☐	IMA(1, 1)	23	15278.387	313.71804	316.15579	0.669	309.71804	0.005509	7.574990	77.988694
☐	☐	ARI(1, 1)	23	15281.774	313.72302	316.16077	0.669	309.72302	0.005495	7.599275	78.171375
☐	☐	IMA(1, 2)	22	14871.002	314.08808	317.74470	0.692	308.08808	0.004578	7.094199	72.687056
☐	☐	ARI(2, 1)	22	15068.24	314.36773	318.02436	0.688	308.36773	0.003981	7.186773	73.525050
☐	☐	ARIMA(1, 1, 2	21	13528.742	314.47764	319.35315	0.718	306.47764	0.003768	7.075296	70.973505
☐	☐	ARI(1, 2)	22	26418.202	314.53443	316.89053	0.431	310.53443	0.003663	8.853628	93.980697
☐	☐	ARIMA(1, 1, 1	22	15457.714	314.95961	318.61624	0.680	308.95961	0.002961	7.070606	72.636339
☐	☐	ARIMA(2, 1, 1	21	15510.234	315.97065	320.84616	0.693	307.97065	0.001786	7.013814	71.210844
☐	☐	ARIMA(2, 1, 2	20	14086.523	316.10497	322.19934	0.721	306.10497	0.001670	6.890521	69.216571
☐	☐	I(2)	23	29739.059	316.29282	317.47087	0.331	314.29282	0.001520	8.981139	96.258450
☐	☐	AR(1)	24	13910.33	324.91223	327.42842	0.676	320.91223	0.000020	6.857048	67.037860
☐	☐	ARMA(1, 1)	23	14204.302	326.41587	330.19015	0.680	320.41587	0.000010	6.900018	68.157671
☐	☐	AR(2)	23	14325.856	326.60358	330.37787	0.679	320.60358	0.000009	6.818276	67.130939
☐	☐	ARMA(2, 1)	22	14438.053	327.75473	332.78712	0.688	319.75473	0.000005	6.937116	68.285745
☐	☐	ARMA(1, 2)	22	14461.743	327.80157	332.83396	0.688	319.80157	0.000005	6.983917	68.605731
☐	☐	ARMA(2, 2)	21	15037.784	329.61873	335.90921	0.690	319.61873	0.000002	6.961952	68.257951
☐	☐	MA(2)	23	17738.926	332.03792	335.81221	0.610	326.03792	0.000001	9.746234	93.105415
☐	☐	MA(1)	24	21052.328	335.38213	337.89833	0.530	331.38213	0.000000	11.666784	109.17203
☐	☐	ARIMA(0, 0, 0	25	44815.729	353.23324	354.49134	0.000	351.23324	0.000000	19.219940	178.55083



Model: IMA(2, 1)

Model Summary

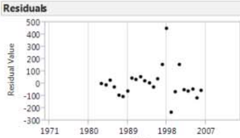
DF	22	Stable	Yes
Sum of Squared Errors	346274.345	Invertible	Yes
Variance Estimate	15739.743		
Standard Deviation	125.458132		
Akaike's 'A' Information Criterion	305.17431		
Schwarz's Bayesian Criterion	307.530418		
RSquare	0.63792023		
RSquare Adj	0.62146206		
MAPE	7.92557157		
MAE	81.6944075		
-2LogLikelihood	301.17431		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
MA1	1	1.000000	0.141587	7.06	<.0001*	-2.0178241
Intercept	0	-2.017824	3.331212	-0.61	0.5509	

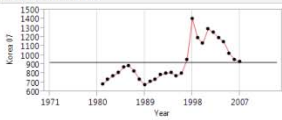
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0152	0.0062	0.9370	1	0.0152
2	-0.2218	1.4022	0.4961	2	-0.2221
3	0.1224	1.8471	0.6047	3	0.1366
4	0.0078	1.8490	0.7635	4	-0.0537
5	-0.0193	1.8613	0.8680	5	0.0440
6	0.0452	1.9322	0.9258	6	0.0181
7	-0.1036	2.3263	0.9396	7	-0.1040
8	-0.1167	2.8575	0.9430	8	-0.1003
9	-0.1774	4.1663	0.9001	9	-0.2462
10	-0.1413	5.0567	0.8874	10	-0.1728
11	-0.0341	5.1127	0.9256	11	-0.1314
12	0.0006	5.1127	0.9541	12	-0.0424
13	-0.0061	5.1148	0.9726	13	-0.0082
14	-0.0638	5.3686	0.9800	14	-0.0801
15	0.0080	5.3731	0.9885	15	-0.0087
16	0.0605	5.6589	0.9914	16	-0.0405
17	0.0536	5.9152	0.9937	17	-0.0221
18	0.0479	6.1537	0.9955	18	-0.0591
19	0.0234	6.2220	0.9973	19	-0.0812
20	-0.0020	6.2227	0.9986	20	-0.0839
21	-0.0006	6.2227	0.9992	21	-0.0914
22	0.0021	6.2241	0.9996	22	-0.0689
23	0.0001	6.2241	0.9998	23	-0.0740
24	0.0000	.	.	24	-0.0489
25	0.0000	.	.	25	-0.0273

Time Series Korea 07



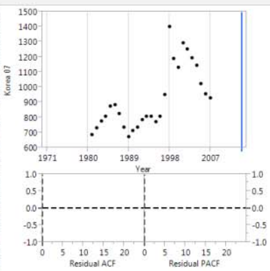
Mean	921.38038
Std	203.71122
N	27
Zero Mean ADF	0.0324204
Single Mean ADF	-1.690874
Trend ADF	-1.697306

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8168	20.0923	<.0001*	1	0.8168
2	0.6337	32.6711	<.0001*	2	-0.1005
3	0.5251	41.6678	<.0001*	3	0.1140
4	0.3834	46.6710	<.0001*	4	-0.1820
5	0.2556	48.9961	<.0001*	5	-0.0126
6	0.1416	49.7437	<.0001*	6	-0.1027
7	0.0075	49.7460	<.0001*	7	-0.1359
8	-0.1129	50.2716	<.0001*	8	-0.0890
9	-0.2143	52.2698	<.0001*	9	-0.0984
10	-0.2513	55.1774	<.0001*	10	0.0953
11	-0.2452	58.1191	<.0001*	11	0.0361
12	-0.2307	60.8970	<.0001*	12	0.0346
13	-0.2254	63.7373	<.0001*	13	-0.0670
14	-0.2302	66.9289	<.0001*	14	-0.0797
15	-0.2397	70.6771	<.0001*	15	-0.0930
16	-0.2611	75.5285	<.0001*	16	-0.1430
17	-0.2787	81.6120	<.0001*	17	-0.0873
18	-0.2082	85.3840	<.0001*	18	0.1993
19	-0.1939	89.0654	<.0001*	19	-0.1654
20	-0.1974	93.4253	<.0001*	20	0.0678
21	-0.1559	96.5986	<.0001*	21	0.0075
22	-0.1116	98.5504	<.0001*	22	0.0477
23	-0.0694	99.4922	<.0001*	23	-0.0175
24	-0.0281	99.6976	<.0001*	24	-0.0879
25	-0.0082	99.7239	<.0001*	25	-0.0709

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	IMA(2, 1)	23	15059.008	316.61377	319.05153	0.638	312.61377	0.399006	7.637555	78.665664
☐	☐	IMA(2, 2)	22	15773.837	318.52044	322.17707	0.638	312.52044	0.153799	7.466178	77.356569
☐	☐	ARIMA(1, 2, 1	22	15765.538	318.55751	322.21414	0.638	312.55751	0.150974	7.541782	77.972156
☐	☐	ARIMA(2, 2, 1	21	15681.021	319.66589	324.54139	0.655	311.66589	0.086740	7.434246	76.055737
☐	☐	ARIMA(1, 2, 2	21	15994.949	319.72838	324.60388	0.649	311.72838	0.084072	7.135654	73.510467
☐	☐	ARIMA(2, 2, 2	20	16136.592	321.09656	327.19094	0.662	311.09656	0.042419	7.252257	73.646022
☐	☐	ARI(2, 2)	22	19411.478	321.29047	324.94710	0.582	315.29047	0.038499	7.609991	76.520720
☐	☐	I(1)	25	14112.762	323.19077	324.44887	0.668	321.19077	0.014887	7.488579	76.733304
☐	☐	IMA(1, 1)	24	14686.101	325.16638	327.68257	0.668	321.16638	0.005544	7.404538	76.090572
☐	☐	ARI(1, 1)	24	14692.606	325.17680	327.69300	0.668	321.1768	0.005515	7.442858	76.392117
☐	☐	IMA(1, 2)	23	14436.263	325.73659	329.51088	0.687	319.73659	0.004169	7.074891	72.331849
☐	☐	ARI(2, 1)	23	14599.202	325.99113	329.76542	0.684	319.99113	0.003670	7.162588	73.091880
☐	☐	ARIMA(1, 1, 1	23	14844.64	326.39679	330.17107	0.679	320.39679	0.002997	6.952742	71.241352
☐	☐	ARI(1, 2)	23	25483.933	326.65328	329.09103	0.426	322.65328	0.002636	8.774356	92.818865
☐	☐	ARIMA(2, 1, 1	22	14965.54	327.52889	332.56127	0.690	319.52889	0.001701	7.007396	70.926253
☐	☐	ARIMA(1, 1, 2	22	15049.066	327.65414	332.68653	0.688	319.65414	0.001598	7.030750	71.557206
☐	☐	I(2)	24	28595.514	328.45150	329.67038	0.328	326.4515	0.001073	8.826641	94.285220
☐	☐	ARIMA(2, 1, 2	21	15630.245	329.46573	335.75622	0.691	319.46573	0.000646	6.908924	69.772103
☐	☐	AR(1)	25	13361.179	336.20902	338.80069	0.676	332.20902	0.000022	6.651168	65.051941
☐	☐	ARMA(1, 1)	24	13612.02	337.67684	341.56435	0.681	331.67684	0.000011	6.666770	65.863930
☐	☐	AR(2)	24	13728.614	337.87341	341.76092	0.679	331.87341	0.000010	6.589983	64.896222
☐	☐	ARMA(2, 1)	23	13818.949	339.00305	344.18640	0.689	331.00305	0.000005	6.722901	66.220120
☐	☐	ARMA(1, 2)	23	13854.509	339.07329	344.25664	0.688	331.07329	0.000005	6.788096	66.759479
☐	☐	ARMA(2, 2)	22	14374.942	340.88039	347.35957	0.691	330.88039	0.000002	6.765086	66.408722
☐	☐	MA(2)	24	17000.601	343.52122	347.40873	0.611	337.52122	0.000001	9.397182	89.816036
☐	☐	MA(1)	25	20218.501	347.08501	349.67669	0.530	343.08501	0.000000	11.260795	105.45654
☐	☐	ARIMA(0, 0, 0	26	43094.349	365.72467	367.02050	0.000	363.72467	0.000000	18.551267	172.28388



Model: IMA(2, 1)

Model Summary

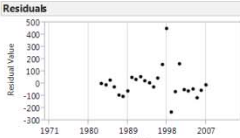
DF	23	Stable	Yes
Sum of Squared Errors	346357.191	Invertible	Yes
Variance Estimate	15059.0083		
Standard Deviation	122.715151		
Akaike's 'A' Information Criterion	316.613774		
Schwarz's Bayesian Criterion	319.051526		
RSquare	0.63786596		
RSquare Adj	0.622121		
MAPE	7.63755542		
MAE	78.6656643		
-2LogLikelihood	312.613774		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
MA1	1	1.000000	0.134963	7.41	<.0001*	-2.1019907
Intercept	0	-2.101991	3.078788	-0.68	0.5016	

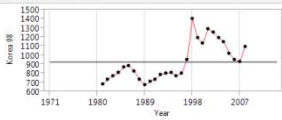
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0169	0.0080	0.9288	1	0.0169
2	-0.2182	1.4053	0.4953	2	-0.2185
3	0.1242	1.8784	0.5980	3	0.1390
4	0.0102	1.8817	0.7575	4	-0.0501
5	-0.0171	1.8915	0.8639	5	0.0461
6	0.0414	1.9524	0.9240	6	0.0147
7	-0.1011	2.3359	0.9389	7	-0.1006
8	-0.1091	2.8082	0.9458	8	-0.0944
9	-0.1894	4.3216	0.8890	9	-0.2559
10	-0.1458	5.2788	0.8718	10	-0.1723
11	-0.0356	5.3400	0.9136	11	-0.1380
12	0.0010	5.3401	0.9456	12	-0.0356
13	-0.0066	5.3426	0.9669	13	-0.0073
14	-0.0649	5.6009	0.9756	14	-0.0750
15	0.0060	5.6033	0.9857	15	-0.0062
16	0.0590	5.8648	0.9895	16	-0.0401
17	0.0516	6.0896	0.9926	17	-0.0221
18	0.0489	6.3203	0.9947	18	-0.0627
19	0.0261	6.3967	0.9968	19	-0.0823
20	0.0005	6.3967	0.9982	20	-0.0851
21	0.0003	6.3967	0.9991	21	-0.0897
22	0.0014	6.3972	0.9995	22	-0.0664
23	0.0005	6.3972	0.9997	23	-0.0732
24	0.0000	6.3972	0.9999	24	-0.0481
25	0.0000	.	.	25	-0.0279

Time Series Korea 08



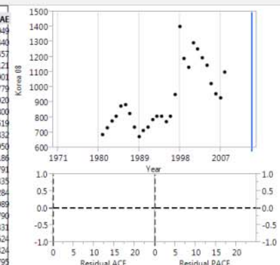
Mean	927.71344
Std	202.7291
N	28
Zero Mean ADF	0.2963673
Single Mean ADF	-1.650699
Trend ADF	-2.096153

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.7951	19.6693	<.0001*	1	0.7951
2	0.6197	32.0783	<.0001*	2	-0.0339
3	0.5241	41.3058	<.0001*	3	0.1131
4	0.4046	47.0364	<.0001*	4	-0.1088
5	0.2884	50.0738	<.0001*	5	-0.0455
6	0.1876	51.4179	<.0001*	6	-0.0629
7	0.0648	51.5858	<.0001*	7	-0.1383
8	-0.0764	51.8308	<.0001*	8	-0.1635
9	-0.1663	53.0529	<.0001*	9	-0.0250
10	-0.1695	54.3934	<.0001*	10	0.1298
11	-0.2309	57.0277	<.0001*	11	-0.1606
12	-0.2402	60.0576	<.0001*	12	0.1120
13	-0.2413	63.3192	<.0001*	13	-0.0881
14	-0.2423	66.8404	<.0001*	14	0.0265
15	-0.2531	70.9812	<.0001*	15	-0.1176
16	-0.2785	76.4120	<.0001*	16	-0.1366
17	-0.3037	83.4572	<.0001*	17	-0.1106
18	-0.2375	88.1960	<.0001*	18	0.2107
19	-0.2290	93.0887	<.0001*	19	-0.1816
20	-0.2233	98.3237	<.0001*	20	0.0125
21	-0.1678	101.702	<.0001*	21	0.1133
22	-0.1144	103.535	<.0001*	22	-0.0094
23	-0.0739	104.451	<.0001*	23	0.0395
24	-0.0427	104.834	<.0001*	24	-0.1379
25	-0.0283	105.058	<.0001*	25	-0.0837

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	IMA(2, 1)	24	15708.114	330.20978	332.72597	0.616	326.20978	0.394999	8.220993	85.236949
☐	☐	IMA(2, 2)	23	16428.096	332.12691	335.90120	0.616	326.12691	0.151459	8.074863	84.132340
☐	☐	ARIMA(1, 2, 1	23	16415.356	332.16402	335.93831	0.616	326.16402	0.148675	8.148842	84.729457
☐	☐	ARIMA(2, 2, 1	22	16129.383	333.02332	338.05570	0.637	325.02332	0.096748	7.872884	81.038121
☐	☐	ARIMA(1, 2, 2	22	16713.355	333.43008	338.46247	0.626	325.43008	0.078943	7.688516	79.818901
☐	☐	ARIMA(2, 2, 2	21	16768.508	334.71807	341.00856	0.640	324.71807	0.041460	7.726603	79.120779
☐	☐	ARI(2, 2)	23	21297.786	336.33258	340.10687	0.532	330.33258	0.018495	8.251216	83.842920
☐	☐	I(1)	26	14522.765	336.35745	337.65329	0.654	334.35745	0.018266	7.729455	79.843800
☐	☐	ARIMA(1, 1, 1	24	13312.111	337.53169	341.41920	0.693	331.53169	0.010155	7.207086	72.249519
☐	☐	ARIMA(1, 1, 2	23	13034.971	338.26565	343.44899	0.710	330.26565	0.007035	7.203895	72.265832
☐	☐	IMA(1, 1)	25	15101.722	338.35421	340.94588	0.654	334.35421	0.006731	7.707309	79.692950
☐	☐	ARI(1, 1)	25	15102.707	338.35579	340.94746	0.654	334.35579	0.006725	7.718428	79.770186
☐	☐	IMA(1, 2)	24	14585.987	338.48718	342.37469	0.679	332.48718	0.006298	7.378826	75.388791
☐	☐	ARI(2, 1)	24	14799.543	338.81990	342.70741	0.674	332.8199	0.005333	7.406155	75.839335
☐	☐	ARIMA(2, 1, 2	22	13561.074	340.01193	346.49111	0.712	330.01193	0.002938	7.097712	71.160284
☐	☐	ARI(1, 2)	24	26294.582	340.44255	342.95874	0.397	336.44255	0.002369	9.120752	96.884989
☐	☐	ARIMA(2, 1, 1	23	15316.648	340.62434	345.80768	0.677	332.62434	0.002163	7.237040	73.854790
☐	☐	I(2)	25	28958.511	341.87917	343.13727	0.308	339.87917	0.001155	9.196648	98.188331
☐	☐	AR(1)	26	14010.55	349.87644	352.54085	0.651	345.87644	0.000021	7.124423	69.722624
☐	☐	ARMA(1, 1)	25	14311.337	351.43429	355.43091	0.655	345.43429	0.000010	7.200949	70.868324
☐	☐	AR(2)	25	14425.026	351.62207	355.61868	0.653	345.62207	0.000009	7.072803	69.489795
☐	☐	ARMA(1, 2)	24	14484.239	352.70831	358.03713	0.664	344.70831	0.000005	7.285680	71.492910
☐	☐	ARMA(2, 1)	24	14565.021	352.84217	358.17099	0.662	344.84217	0.000005	7.223351	70.967223
☐	☐	ARMA(2, 2)	23	15068.424	354.62555	361.28658	0.665	344.62555	0.000002	7.265763	71.177740
☐	☐	MA(2)	25	17635.151	357.10271	361.09933	0.589	351.10271	0.000001	10.028891	95.461248
☐	☐	MA(1)	26	20820.13	360.61641	363.28082	0.509	356.61641	0.000000	11.853645	110.71949
☐	☐	ARIMA(0, 0, 0	27	42621.277	378.92531	380.25752	0.000	376.92531	0.000000	18.690244	173.36867



Model: IMA(2, 1)

Model Summary

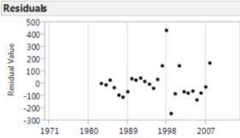
DF	24	Stable	Yes
Sum of Squared Errors	376994.727	Invertible	Yes
Variance Estimate	15708.1136		
Standard Deviation	125.332014		
Akaike's 'A' Information Criterion	330.209775		
Schwarz's Bayesian Criterion	332.725968		
RSquare	0.61600221		
RSquare Adj	0.6000023		
MAPE	8.22099308		
MAE	85.236949		
-2LogLikelihood	326.209775		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
MA1	1	0.9999999	0.112280	8.91	<.0001*	-0.6038237
Intercept	0	-0.6038237	2.968677	-0.20	0.8405	

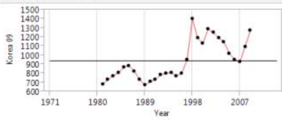
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0101	0.0030	0.9566	1	0.0101
2	-0.2294	1.5989	0.4496	2	-0.2295
3	0.0557	1.6971	0.6376	3	0.0643
4	-0.0213	1.7121	0.7885	4	-0.0809
5	-0.0558	1.8199	0.8735	5	-0.0268
6	0.0015	1.8200	0.9355	6	-0.0251
7	-0.0343	1.8650	0.9669	7	-0.0511
8	-0.1405	2.6637	0.9537	8	-0.1505
9	-0.2954	6.3996	0.6994	9	-0.3432
10	0.0524	6.5244	0.7695	10	-0.0249
11	0.0365	6.5890	0.8313	11	-0.1465
12	0.0234	6.6175	0.8818	12	0.0350
13	-0.0141	6.6287	0.9203	13	-0.1245
14	-0.0530	6.7990	0.9422	14	-0.1049
15	0.0211	6.8286	0.9622	15	-0.0805
16	0.0819	7.3173	0.9666	16	-0.0508
17	0.0690	7.7025	0.9725	17	-0.0442
18	0.0749	8.2123	0.9753	18	-0.0579
19	0.0053	8.2153	0.9844	19	-0.0016
20	-0.0431	8.4405	0.9885	20	-0.0960
21	-0.0400	8.6730	0.9916	21	-0.0589
22	-0.0134	8.7055	0.9947	22	-0.1384
23	0.0121	8.7410	0.9968	23	-0.0750
24	-0.0043	8.7476	0.9981	24	-0.0685
25	0.0005	8.7478	0.9989	25	-0.0110

Time Series Korea 09



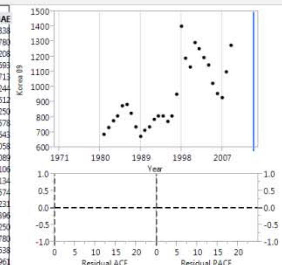
Mean	939.67591
Std	209.01842
N	29
Zero Mean ADF	0.597249
Single Mean ADF	-1.368796
Trend ADF	-2.192131

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.7666	18.8700	<.0001*	1	0.7666
2	0.5605	29.3308	<.0001*	2	-0.0660
3	0.4790	37.2642	<.0001*	3	0.1743
4	0.3886	42.6932	<.0001*	4	-0.0633
5	0.3165	46.4457	<.0001*	5	0.0449
6	0.2393	48.6847	<.0001*	6	-0.0719
7	0.1451	49.5454	<.0001*	7	-0.0708
8	0.0294	49.5826	<.0001*	8	-0.1468
9	-0.0954	49.9914	<.0001*	9	-0.1434
10	-0.0824	50.3127	<.0001*	10	0.1958
11	-0.0800	50.6322	<.0001*	11	-0.0738
12	-0.2079	52.9180	<.0001*	12	-0.2424
13	-0.2505	56.4441	<.0001*	13	0.0756
14	-0.2626	60.5770	<.0001*	14	-0.0694
15	-0.2662	65.1261	<.0001*	15	0.0409
16	-0.2920	71.0206	<.0001*	16	-0.1659
17	-0.3216	78.7712	<.0001*	17	-0.0560
18	-0.2716	84.8009	<.0001*	18	0.1185
19	-0.2704	91.3756	<.0001*	19	-0.0902
20	-0.2755	98.9585	<.0001*	20	-0.0005
21	-0.2076	103.804	<.0001*	21	-0.0464
22	-0.1330	106.074	<.0001*	22	0.1545
23	-0.0787	107.003	<.0001*	23	0.0590
24	-0.0522	107.492	<.0001*	24	-0.1360
25	-0.0565	108.210	<.0001*	25	-0.1005

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	IMA(2, 1)	25	16068.527	343.36160	345.95327	0.629	339.3616	0.350179	8.570747	89.892838
☐	☐	IMA(2, 2)	24	16581.222	344.80597	348.69348	0.633	338.80597	0.170078	8.045481	85.061780
☐	☐	ARIMA(1, 2, 1	24	16672.525	345.03763	348.92514	0.631	339.03763	0.151476	8.310784	87.664208
☐	☐	ARIMA(2, 2, 1	23	16359.108	345.88158	351.06492	0.651	337.88158	0.099331	8.021042	84.015693
☐	☐	ARIMA(1, 2, 2	23	16681.406	345.95921	351.14256	0.646	337.95921	0.095549	7.798243	81.784713
☐	☐	ARIMA(2, 2, 2	22	16936.667	347.49610	353.97529	0.655	337.4961	0.044309	7.853437	81.784244
☐	☐	ARI(2, 2)	24	21079.86	348.79980	352.68731	0.561	342.7998	0.023089	8.263557	84.971612
☐	☐	I(1)	27	14906.458	349.50966	350.84186	0.665	347.50966	0.016190	7.888416	82.729250
☐	☐	ARIMA(1, 1, 2	24	12757.548	350.12534	355.45416	0.731	342.12534	0.011900	7.404161	74.353578
☐	☐	IMA(1, 2)	25	14643.514	351.09008	355.08669	0.695	345.09008	0.007346	7.571464	77.899643
☐	☐	IMA(1, 1)	26	15322.222	351.24204	353.90645	0.668	347.24204	0.006809	7.634752	80.452058
☐	☐	ARI(1, 1)	26	15400.57	351.37110	354.03551	0.666	347.3711	0.006383	7.780763	81.834089
☐	☐	ARI(2, 1)	25	15012.737	351.68429	355.68090	0.687	345.68429	0.005458	7.592102	78.911106
☐	☐	ARIMA(1, 1, 1	25	15369.697	352.29005	356.28666	0.680	346.29005	0.004032	7.346476	76.810134
☐	☐	ARI(1, 2)	25	25442.216	352.55725	355.14892	0.448	348.55725	0.003528	8.922211	95.208574
☐	☐	ARIMA(2, 1, 1	24	15501.118	353.46372	358.79253	0.690	345.46372	0.002242	7.411026	76.765231
☐	☐	I(2)	26	27844.797	353.93253	355.22837	0.371	351.93253	0.001774	8.860189	94.602396
☐	☐	ARIMA(2, 1, 2	23	17498.886	357.50966	364.17068	0.665	347.50966	0.000297	7.888416	82.729250
☐	☐	AR(1)	27	14940.723	364.25947	366.99406	0.641	360.25947	0.000010	7.723174	76.652780
☐	☐	ARMA(1, 1)	26	14752.518	364.90646	369.00834	0.657	358.90646	0.000007	7.807989	77.575638
☐	☐	AR(2)	26	15071.174	365.46389	369.56578	0.650	359.46389	0.000006	7.586581	75.346961
☐	☐	ARMA(1, 2)	25	14944.245	366.21368	371.68286	0.665	358.21368	0.000004	7.695361	76.171291
☐	☐	ARMA(2, 1)	25	15020.841	366.34066	371.80984	0.663	358.34066	0.000004	7.624249	75.462479
☐	☐	MA(2)	26	17917.391	370.33291	374.43480	0.603	364.33291	0.000000	10.278079	98.397874
☐	☐	MA(1)	27	21497.386	374.42286	377.15745	0.520	370.42286	0.000000	12.368185	116.31516
☐	☐	ARIMA(0, 0, 0	28	45249.012	394.15893	395.52623	-0.00	392.15893	0.000000	19.441915	181.32863
☐	☐	ARMA(2, 2)	24	52761.62	402.16688	409.00336	-0.00	392.16688	0.000000	19.454423	181.39247



Model: IMA(2, 1)

Model Summary

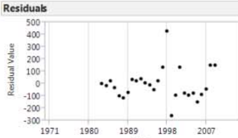
DF	25	Stable	Yes
Sum of Squared Errors	401713.164	Invertible	Yes
Variance Estimate	16068.5265		
Standard Deviation	126.761692		
Akaike's 'A' Information Criterion	343.361596		
Schwarz's Bayesian Criterion	345.95327		
RSquare	0.62861783		
RSquare Adj	0.61376254		
MAPE	8.57074665		
MAE	89.8928378		
-2LogLikelihood	339.361596		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
MA1	1	0.99999924	0.106739	9.37	<.0001*	0.6456093
Intercept	0	0.64560930	2.854430	0.23	0.8229	

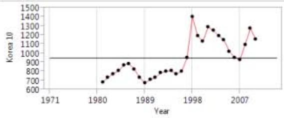
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0739	0.1646	0.6849	1	0.0739
2	-0.2244	1.7411	0.4187	2	-0.2311
3	0.0240	1.7599	0.6237	3	0.0653
4	-0.0742	1.9472	0.7455	4	-0.1437
5	-0.0820	2.1863	0.8228	5	-0.0416
6	-0.0357	2.2339	0.8970	6	-0.0833
7	-0.0665	2.4071	0.9339	7	-0.0849
8	-0.0848	2.7031	0.9516	8	-0.1149
9	-0.3158	7.0414	0.6328	9	-0.3913
10	-0.0581	7.1967	0.7068	10	-0.1027
11	0.1924	9.0077	0.6212	11	-0.0377
12	0.0785	9.3296	0.6746	12	-0.0133
13	0.0029	9.3300	0.7476	13	-0.0909
14	-0.0602	9.5484	0.7944	14	-0.2088
15	0.0218	9.5794	0.8453	15	-0.0783
16	0.0851	10.0946	0.8616	16	-0.0922
17	0.0868	10.6849	0.8725	17	-0.0060
18	0.0866	11.3374	0.8795	18	-0.0828
19	0.0274	11.4110	0.9092	19	-0.0278
20	-0.0585	11.7944	0.9230	20	-0.0077
21	-0.0764	12.5555	0.9234	21	-0.0653
22	-0.0479	12.9149	0.9355	22	-0.0908
23	-0.0008	12.9150	0.9538	23	-0.1298
24	0.0068	12.9271	0.9673	24	-0.0311
25	-0.0021	12.9289	0.9774	25	0.0186

Time Series Korea 10



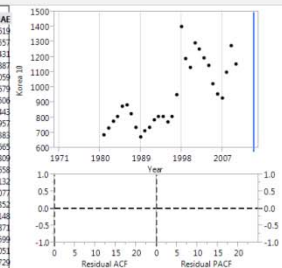
Mean	946.87801
Std	209.13309
N	30
Zero Mean ADF	0.3404918
Single Mean ADF	-1.66785
Trend ADF	-2.319108

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.7940	20.8689	<.0001*	1	0.7940
2	0.5666	31.8777	<.0001*	2	-0.1725
3	0.4599	39.3989	<.0001*	3	0.1935
4	0.3759	44.6173	<.0001*	4	-0.0619
5	0.3175	48.4877	<.0001*	5	0.0825
6	0.2631	51.2564	<.0001*	6	-0.0448
7	0.1803	52.6133	<.0001*	7	-0.0744
8	0.0784	52.8815	<.0001*	8	-0.1045
9	-0.0350	52.9377	<.0001*	9	-0.1347
10	-0.0484	53.0502	<.0001*	10	0.1743
11	-0.0365	53.1174	<.0001*	11	-0.0683
12	-0.1248	53.9487	<.0001*	12	-0.2050
13	-0.2379	57.1440	<.0001*	13	-0.1155
14	-0.2746	61.6697	<.0001*	14	0.0539
15	-0.2851	66.8717	<.0001*	15	-0.0409
16	-0.3061	73.2951	<.0001*	16	-0.0926
17	-0.3356	81.6132	<.0001*	17	-0.1066
18	-0.2890	88.2964	<.0001*	18	0.1837
19	-0.2953	95.9065	<.0001*	19	-0.1927
20	-0.3046	104.814	<.0001*	20	0.1070
21	-0.2444	111.188	<.0001*	21	-0.0344
22	-0.1622	114.344	<.0001*	22	0.0789
23	-0.0945	115.568	<.0001*	23	0.0862
24	-0.0588	116.121	<.0001*	24	-0.0477
25	-0.0649	116.928	<.0001*	25	-0.1203

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	IMA(2, 1)	26	16195.169	356.14192	358.80633	0.624	352.14192	0.356689	8.550356	90.248619
☐	☐	IMA(2, 2)	25	16865.479	357.98505	361.98166	0.624	351.98505	0.141925	8.302608	88.145557
☐	☐	ARIMA(1, 2, 1	25	16859.572	358.06743	362.06405	0.624	352.06743	0.136198	8.449669	89.452431
☐	☐	ARIMA(2, 2, 1	24	16079.368	358.18695	363.51576	0.653	350.18695	0.128297	8.108349	84.965887
☐	☐	ARIMA(1, 2, 2	24	16832.073	358.85381	364.18263	0.639	350.85381	0.091920	7.867516	83.055059
☐	☐	ARIMA(2, 2, 2	23	16651.735	359.83323	366.49425	0.657	349.83323	0.056329	7.924610	82.571679
☐	☐	I(1)	28	15049.04	362.23380	363.60110	0.661	360.2338	0.016961	8.031677	84.534506
☐	☐	ARI(2, 2)	25	21801.147	362.67470	366.67132	0.542	356.6747	0.013605	8.557374	88.814443
☐	☐	ARIMA(1, 1, 2	25	12872.356	362.79904	368.26823	0.727	354.79904	0.012785	7.448678	75.719957
☐	☐	IMA(1, 2)	26	14406.743	363.11808	367.21997	0.698	357.11808	0.010900	7.614313	78.420383
☐	☐	ARI(2, 1)	26	14822.118	363.81833	367.92021	0.690	357.81833	0.007680	7.678020	79.809665
☐	☐	IMA(1, 1)	27	15598.361	364.21995	366.95454	0.661	360.21995	0.006283	7.987317	84.203309
☐	☐	ARI(1, 1)	27	15603.033	364.22773	366.96232	0.661	360.22773	0.006259	8.013771	84.406658
☐	☐	ARIMA(2, 1, 2	24	13334.092	364.48460	371.32108	0.729	354.4846	0.005504	7.328595	74.517132
☐	☐	ARIMA(1, 1, 1	26	15551.235	365.12160	369.22349	0.674	359.1216	0.004003	7.492342	78.721077
☐	☐	ARIMA(2, 1, 1	25	15296.648	365.62278	371.09197	0.692	357.62278	0.003116	7.440461	77.243352
☐	☐	ARI(1, 2)	26	27782.604	368.00578	370.67019	0.393	364.00578	0.000946	9.545912	102.63148
☐	☐	I(2)	27	30019.699	369.11132	370.44352	0.319	367.11132	0.000545	9.468771	102.21871
☐	☐	AR(1)	28	14612.798	375.95776	378.76015	0.654	371.95776	0.000018	7.541746	75.307599
☐	☐	ARMA(1, 1)	27	14524.23	376.77908	380.98267	0.667	370.77908	0.000012	7.747735	77.541051
☐	☐	AR(2)	27	14843.173	377.35494	381.55853	0.661	371.35494	0.000009	7.494628	75.021729
☐	☐	ARMA(1, 2)	26	14554.434	377.81828	383.42307	0.677	369.81828	0.000007	7.586075	75.591809
☐	☐	ARMA(2, 1)	26	14691.554	378.05670	383.66149	0.674	370.0567	0.000006	7.571867	75.574952
☐	☐	ARMA(2, 2)	25	15166.844	380.36415	387.37013	0.672	370.36415	0.000002	8.074334	79.483856
☐	☐	MA(2)	27	17264.619	381.85613	386.05972	0.616	375.85613	0.000001	9.956004	95.504708
☐	☐	MA(1)	28	20876.288	386.35596	389.15836	0.533	382.35596	0.000000	12.249575	115.20858
☐	☐	ARIMA(0, 0, 0	29	45244.808	407.71456	409.11576	0.000	405.71456	0.000000	19.668024	183.44672



Model: IMA(2, 1)

Model Summary

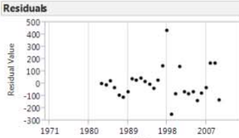
DF	26	Stable	Yes
Sum of Squared Errors	421074.394	Invertible	Yes
Variance Estimate	16195.169		
Standard Deviation	127.260241		
Akaike's 'A' Information Criterion	356.141919		
Schwarz's Bayesian Criterion	358.806328		
RSquare	0.62377362		
RSquare Adj	0.60930337		
MAPE	8.55035559		
MAE	90.2486188		
-2LogLikelihood	352.141919		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
MA1	1	0.9999992	0.100514	9.95	<.0001*	-0.3838206
Intercept	0	-0.3838206	2.703730	-0.14	0.8882	

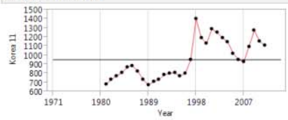
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0236	0.0173	0.8954	1	0.0236
2	-0.2655	2.2952	0.3174	2	-0.2662
3	0.0300	2.3254	0.5077	3	0.0476
4	-0.0479	2.4057	0.6616	4	-0.1310
5	-0.0352	2.4508	0.7839	5	-0.0072
6	-0.0111	2.4555	0.8734	6	-0.0658
7	-0.0342	2.5024	0.9269	7	-0.0408
8	-0.0536	2.6229	0.9558	8	-0.0844
9	-0.3395	7.7187	0.5627	9	-0.3995
10	-0.0251	7.7481	0.6534	10	-0.0683
11	0.2695	11.3360	0.4156	11	0.0477
12	-0.0519	11.4772	0.4885	12	-0.1115
13	-0.0428	11.5798	0.5624	13	-0.0403
14	-0.0705	11.8778	0.6161	14	-0.2372
15	0.0297	11.9348	0.6840	15	-0.0030
16	0.0820	12.4055	0.7156	16	-0.0985
17	0.0761	12.8474	0.7463	17	0.0251
18	0.0651	13.2034	0.7794	18	-0.0988
19	0.0142	13.2223	0.8270	19	-0.0184
20	-0.0737	13.7919	0.8409	20	0.0260
21	-0.0585	14.2027	0.8607	21	-0.1585
22	-0.0148	14.2335	0.8930	22	-0.1059
23	0.0268	14.3544	0.9163	23	-0.1242
24	0.0155	14.4050	0.9370	24	-0.0165
25	-0.0114	14.4411	0.9535	25	0.0246

Time Series Korea 11



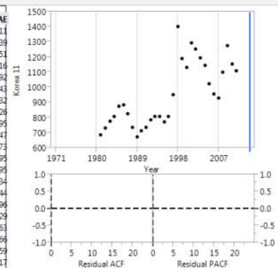
Mean	952.0413
Std	207.66698
N	31
Zero Mean ADF	0.2497861
Single Mean ADF	-1.768886
Trend ADF	-2.309067

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8032	22.0011	<.0001*	1	0.8032
2	0.5943	34.4608	<.0001*	2	-0.1434
3	0.4691	42.5002	<.0001*	3	0.1106
4	0.3664	47.5860	<.0001*	4	-0.0441
5	0.3116	51.4075	<.0001*	5	0.0956
6	0.2664	54.3105	<.0001*	6	-0.0251
7	0.1995	56.0063	<.0001*	7	-0.0534
8	0.1050	56.4965	<.0001*	8	-0.1167
9	0.0005	56.4965	<.0001*	9	-0.0963
10	-0.0074	56.4992	<.0001*	10	0.1742
11	-0.0145	56.5099	<.0001*	11	-0.0923
12	-0.0941	56.9865	<.0001*	12	-0.1780
13	-0.1794	58.8164	<.0001*	13	-0.0948
14	-0.2679	63.1345	<.0001*	14	-0.1068
15	-0.2965	68.7573	<.0001*	15	0.0862
16	-0.3221	75.8333	<.0001*	16	-0.1586
17	-0.3477	84.6666	<.0001*	17	-0.0615
18	-0.3009	91.7922	<.0001*	18	0.1260
19	-0.3092	99.9430	<.0001*	19	-0.1281
20	-0.3240	109.707	<.0001*	20	0.0296
21	-0.2676	117.033	<.0001*	21	0.0358
22	-0.1910	121.180	<.0001*	22	0.0806
23	-0.1174	122.943	<.0001*	23	0.0461
24	-0.0715	123.690	<.0001*	24	-0.0021
25	-0.0707	124.542	<.0001*	25	-0.1028

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	IMA(2, 1)	27	15708.809	367.82465	370.55924	0.627	363.82465	0.336899	8.359263	88.349011
☐	☐	IMA(2, 2)	26	16289.101	369.54441	373.64629	0.629	363.54441	0.142581	8.004473	85.158939
☐	☐	ARIMA(2, 2, 1	25	15433.08	369.57542	375.04461	0.659	361.57542	0.140386	7.844732	82.209251
☐	☐	ARIMA(1, 2, 1	26	16312.194	369.69192	373.79381	0.628	363.69192	0.132442	8.216563	87.153616
☐	☐	ARIMA(1, 2, 2	25	16191.852	370.33488	375.80406	0.645	362.33488	0.096031	7.649942	80.857592
☐	☐	ARIMA(2, 2, 2	24	15969.781	371.24068	378.07716	0.662	361.24068	0.061055	7.705716	80.347643
☐	☐	I(1)	29	14670.916	373.92793	375.32913	0.663	371.92793	0.015929	7.952215	83.738732
☐	☐	ARIMA(1, 1, 2	26	12398.834	374.03112	379.63591	0.731	366.03112	0.015128	7.237493	73.824326
☐	☐	IMA(1, 2)	27	13880.032	374.42625	378.62984	0.703	368.42625	0.012416	7.397718	76.238995
☐	☐	ARI(2, 2)	26	21183.647	374.63963	378.74152	0.545	368.63963	0.011160	8.329182	86.678547
☐	☐	ARI(2, 1)	27	14275.357	375.14570	379.34929	0.695	369.1457	0.008665	7.457426	77.551773
☐	☐	ARIMA(2, 1, 2	25	12842.307	375.76275	382.76874	0.733	365.76275	0.006364	7.136004	72.894295
☐	☐	IMA(1, 1)	28	15148.874	375.84352	378.64592	0.664	371.84352	0.006113	7.803257	82.465295
☐	☐	ARI(1, 1)	28	15176.369	375.89253	378.69492	0.664	371.89253	0.005965	7.898489	83.306234
☐	☐	ARIMA(1, 1, 1	27	15026.425	376.59205	380.79564	0.679	370.59205	0.004204	7.349211	77.309344
☐	☐	ARIMA(2, 1, 1	26	14730.153	376.98203	382.58682	0.697	368.98203	0.003459	7.276332	75.619296
☐	☐	ARI(1, 2)	27	26778.6	380.00518	382.73977	0.402	376.00518	0.000763	9.263407	99.599629
☐	☐	I(2)	28	29146.591	381.40349	382.77079	0.325	379.40349	0.000379	9.356647	101.04263
☐	☐	AR(1)	29	14117.651	387.31319	390.18116	0.661	383.31319	0.000020	7.319329	73.161866
☐	☐	ARMA(1, 1)	28	14050.044	388.17959	392.48155	0.671	382.17959	0.000013	7.571959	75.808359
☐	☐	AR(2)	28	14312.506	388.68367	392.98564	0.666	382.68367	0.000010	7.273242	72.800417
☐	☐	ARMA(1, 2)	27	14039.707	389.15590	394.89185	0.681	381.1559	0.000008	7.443375	74.172389
☐	☐	ARMA(2, 1)	27	14161.514	389.37512	395.11107	0.679	381.37512	0.000007	7.390147	73.741589
☐	☐	ARMA(2, 2)	26	14565.927	391.12362	398.29355	0.681	381.12362	0.000003	7.405742	73.736919
☐	☐	MA(2)	28	17194.402	394.29472	398.59668	0.610	388.29472	0.000001	10.244627	98.018223
☐	☐	MA(1)	29	20579.056	398.71644	401.58442	0.531	394.71644	0.000000	12.353468	116.10565
☐	☐	ARIMA(0, 0, 0	30	44563.094	420.80221	422.23619	0.000	418.80221	0.000000	19.659122	183.19205



Model: IMA(2, 1)

Model Summary

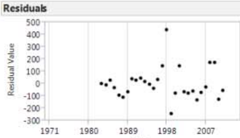
DF	27	Stable	Yes
Sum of Squared Errors	424137.84	Invertible	Yes
Variance Estimate	15708.8089		
Standard Deviation	125.334787		
Akaike's 'A' Information Criterion	367.824653		
Schwarz's Bayesian Criterion	370.559244		
RSquare	0.62731819		
RSquare Adj	0.61351516		
MAPE	8.35926259		
MAE	88.3490112		
-2LogLikelihood	363.824653		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
MA1	1	1.000000	0.097358	10.27	<.0001*	-0.7659945
Intercept	0	-0.765995	2.546355	-0.30	0.7659	

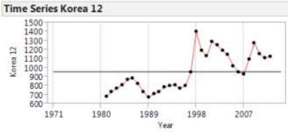
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0407	0.0531	0.8177	1	0.0407
2	-0.2827	2.7148	0.2573	2	-0.2849
3	0.0090	2.7176	0.4372	3	0.0386
4	-0.0454	2.7918	0.5932	4	-0.1405
5	-0.0268	2.8187	0.7279	5	-0.0018
6	0.0049	2.8196	0.8311	6	-0.0536
7	-0.0259	2.8470	0.8988	7	-0.0321
8	-0.0425	2.9242	0.9390	8	-0.0651
9	-0.3271	7.7345	0.5611	9	-0.3847
10	-0.0406	7.8124	0.6472	10	-0.0527
11	0.2787	11.6908	0.3873	11	0.0615
12	-0.0186	11.7092	0.4693	12	-0.0850
13	-0.0930	12.1950	0.5117	13	-0.0750
14	-0.0884	12.6635	0.5532	14	-0.2194
15	0.0241	12.7008	0.6254	15	-0.0094
16	0.0853	13.2038	0.6578	16	-0.0726
17	0.0751	13.6260	0.6934	17	0.0256
18	0.0615	13.9348	0.7333	18	-0.0829
19	0.0072	13.9395	0.7872	19	-0.0303
20	-0.0781	14.5494	0.8016	20	0.0265
21	-0.0654	15.0297	0.8215	21	-0.1440
22	-0.0094	15.0409	0.8605	22	-0.1300
23	0.0383	15.2612	0.8850	23	-0.1204
24	0.0259	15.3823	0.9091	24	-0.0020
25	-0.0079	15.3962	0.9316	25	0.0274

Time Series Korea 12



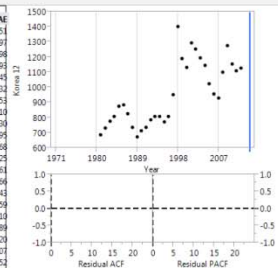
Mean	957.48258
Std	206.62946
N	32
Zero Mean ADF	0.2814018
Single Mean ADF	-1.774811
Trend ADF	-2.347671

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8046	22.7228	<.0001*	1	0.8046
2	0.6061	36.0471	<.0001*	2	-0.1171
3	0.4988	45.3830	<.0001*	3	0.1388
4	0.3766	50.8941	<.0001*	4	-0.1318
5	0.3017	54.5613	<.0001*	5	0.1060
6	0.2602	57.3944	<.0001*	6	-0.0044
7	0.2031	59.1891	<.0001*	7	-0.0270
8	0.1255	59.9032	<.0001*	8	-0.0971
9	0.0289	59.9426	<.0001*	9	-0.1148
10	0.0285	59.9828	<.0001*	10	0.2116
11	0.0272	60.0213	<.0001*	11	-0.0916
12	-0.0705	60.2918	<.0001*	12	-0.2129
13	-0.1464	61.5194	<.0001*	13	-0.0594
14	-0.2058	64.0787	<.0001*	14	-0.0676
15	-0.2898	69.4527	<.0001*	15	-0.0863
16	-0.3343	77.0507	<.0001*	16	-0.0551
17	-0.3640	86.6622	<.0001*	17	-0.1167
18	-0.3128	94.2679	<.0001*	18	0.2168
19	-0.3208	102.879	<.0001*	19	-0.2231
20	-0.3378	113.227	<.0001*	20	0.0871
21	-0.2881	121.435	<.0001*	21	-0.0612
22	-0.2161	126.516	<.0001*	22	0.1983
23	-0.1488	129.194	<.0001*	23	0.0532
24	-0.0965	130.461	<.0001*	24	-0.1123
25	-0.0847	131.575	<.0001*	25	-0.0279

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	IMA(2, 1)	28	15156.91	379.28685	382.08925	0.634	375.28685	0.332472	8.147491	86.136351
☐	☐	ARIMA(2, 2, 1	26	14859.325	380.95089	386.55568	0.665	372.95089	0.144682	7.620418	79.915697
☐	☐	IMA(2, 2)	27	15699.901	381.01741	385.22100	0.635	375.01741	0.139949	7.831819	83.340498
☐	☐	ARIMA(1, 2, 1	27	15718.629	381.16327	385.36686	0.635	375.16327	0.130106	8.032305	85.210493
☐	☐	ARIMA(1, 2, 2	26	15570.171	381.73445	387.33924	0.651	373.73445	0.097784	7.415659	78.388045
☐	☐	ARIMA(2, 2, 2	25	15373.885	382.64094	389.64693	0.668	372.64094	0.062148	7.506704	78.376832
☐	☐	ARIMA(1, 1, 2	27	11994.534	385.27543	391.01138	0.736	377.27543	0.016648	7.021160	71.956753
☐	☐	I(1)	30	14182.755	385.31095	386.74494	0.670	383.31095	0.016355	7.710646	81.210410
☐	☐	IMA(1, 2)	28	13417.552	385.74908	390.05104	0.709	379.74908	0.013137	7.216183	74.533030
☐	☐	ARI(2, 2)	27	20459.44	386.37512	390.57871	0.552	380.37512	0.009606	8.118777	84.569995
☐	☐	ARI(2, 1)	28	13805.93	386.50778	390.80974	0.700	380.50778	0.008990	7.279057	75.887168
☐	☐	ARIMA(2, 1, 2	26	12405.07	387.00885	394.17878	0.737	377.00885	0.006998	6.944914	71.241525
☐	☐	IMA(1, 1)	29	14629.546	387.22778	390.09576	0.671	383.22778	0.006272	7.581752	80.145661
☐	☐	ARI(1, 1)	29	14654.872	387.27622	390.14419	0.671	383.27622	0.006122	7.666216	80.874066
☐	☐	ARIMA(1, 1, 1	28	14490.073	387.92648	392.22844	0.685	381.92648	0.004423	7.120824	74.912143
☐	☐	ARIMA(2, 1, 1	27	14255.184	388.39220	394.12815	0.702	380.3922	0.003504	7.148667	74.473159
☐	☐	ARI(1, 2)	28	26144.575	392.31625	395.11865	0.407	388.31625	0.000493	9.183972	98.944810
☐	☐	I(2)	29	28310.923	393.64936	395.05055	0.334	391.64936	0.000253	9.236728	99.792389
☐	☐	AR(1)	30	13704.588	398.78838	401.71985	0.664	394.78838	0.000019	7.282168	72.857720
☐	☐	ARMA(1, 1)	29	13642.084	399.66149	404.05870	0.674	393.66149	0.000013	7.535077	75.450207
☐	☐	AR(2)	29	13916.552	400.22463	404.62184	0.669	394.22463	0.000009	7.199994	72.037452
☐	☐	ARMA(1, 2)	28	13545.384	400.43368	406.29662	0.686	392.43368	0.000009	7.289782	72.643822
☐	☐	ARMA(2, 1)	28	13691.177	400.72738	406.59033	0.683	392.72738	0.000007	7.276649	72.597105
☐	☐	ARMA(2, 2)	27	14033.91	402.39973	409.72841	0.687	392.39973	0.000003	7.252477	72.209570
☐	☐	MA(2)	29	16689.313	405.97774	410.37495	0.615	399.97774	0.000001	10.125985	96.877728
☐	☐	MA(1)	30	20151.481	410.82108	413.75255	0.535	406.82108	0.000000	12.332764	115.88062
☐	☐	ARIMA(0, 0, 0	31	44073.014	433.99140	435.45714	0.000	431.9914	0.000000	19.724124	183.71451



Model: IMA(2, 1)

Model Summary

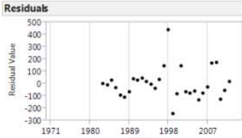
DF	28	Stable	Yes
Sum of Squared Errors	424393.469	Invertible	Yes
Variance Estimate	15156.9096		
Standard Deviation	123.113401		
Akaike's 'A' Information Criterion	379.286853		
Schwarz's Bayesian Criterion	382.089248		
RSquare	0.63433252		
RSquare Adj	0.62127296		
MAPE	8.14749101		
MAE	86.1363508		
-2LogLikelihood	375.286853		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
MA1	1	0.9999995	0.093295	10.72	<.0001*	-0.662772
Intercept	0	-0.6627720	2.386570	-0.28	0.7833	

Forecast

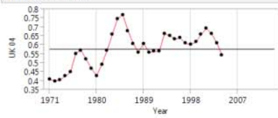
Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0384	0.0487	0.8253	1	0.0384
2	-0.2881	2.8948	0.2352	2	-0.2900
3	0.0154	2.9032	0.4068	3	0.0446
4	-0.0386	2.9581	0.5649	4	-0.1374
5	-0.0274	2.9869	0.7020	5	0.0010
6	0.0023	2.9871	0.8105	6	-0.0548
7	-0.0310	3.0272	0.8825	7	-0.0363
8	-0.0451	3.1159	0.9269	8	-0.0676
9	-0.3304	8.1058	0.5235	9	-0.3924
10	-0.0437	8.1975	0.6096	10	-0.0598
11	0.2837	12.2648	0.3441	11	0.0589
12	-0.0222	12.2911	0.4226	12	-0.0899
13	-0.1035	12.8963	0.4559	13	-0.0827
14	-0.0718	13.2053	0.5104	14	-0.2089
15	0.0301	13.2632	0.5820	15	-0.0176
16	0.0868	13.7800	0.6151	16	-0.0705
17	0.0739	14.1833	0.6541	17	0.0160
18	0.0616	14.4873	0.6968	18	-0.0785
19	0.0082	14.4931	0.7542	19	-0.0349
20	-0.0758	15.0448	0.7738	20	0.0301
21	-0.0637	15.4773	0.7983	21	-0.1452
22	-0.0070	15.4832	0.8407	22	-0.1376
23	0.0366	15.6666	0.8692	23	-0.1123
24	0.0221	15.7446	0.8971	24	-0.0038
25	-0.0113	15.7693	0.9215	25	0.0241

United Kingdom

Time Series UK 04



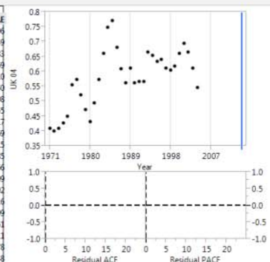
Mean	0.5778302
Std	0.09592
N	34
Zero Mean ADF	0.1178736
Single Mean ADF	-2.085827
Trend ADF	-1.656998

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8115	24.4231	<.0001*	1	0.8115
2	0.5122	34.4571	<.0001*	2	-0.4283
3	0.2295	36.5370	<.0001*	3	-0.0593
4	0.0756	36.7700	<.0001*	4	0.1716
5	0.0289	36.8053	<.0001*	5	0.0059
6	0.1070	37.3057	<.0001*	6	0.2409
7	0.2120	39.3435	<.0001*	7	0.0092
8	0.2334	41.9084	<.0001*	8	-0.1935
9	0.1290	42.7233	<.0001*	9	-0.1379
10	-0.0468	42.8351	<.0001*	10	-0.1033
11	-0.1778	44.5177	<.0001*	11	0.1029
12	-0.2359	47.6144	<.0001*	12	-0.0430
13	-0.2513	51.2952	<.0001*	13	-0.2087
14	-0.1765	53.2015	<.0001*	14	0.2025
15	-0.0361	53.2855	<.0001*	15	0.1347
16	0.0771	53.6902	<.0001*	16	-0.0252
17	0.0949	54.3381	<.0001*	17	-0.0156
18	0.0035	54.3390	<.0001*	18	-0.2657
19	-0.0920	55.0303	<.0001*	19	0.1554
20	-0.1976	58.4435	<.0001*	20	-0.1536
21	-0.2631	64.9587	<.0001*	21	-0.1110
22	-0.2713	72.4670	<.0001*	22	0.0042
23	-0.1953	76.7115	<.0001*	23	-0.1381
24	-0.1328	78.8691	<.0001*	24	-0.0251
25	-0.1248	80.9882	<.0001*	25	0.0262

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARMA(1, 2)	30	0.0018653	-110.9386	-104.8332	0.755	-118.9386	0.361144	6.693961	0.037006
☐	☐	AR(2)	31	0.0019915	-110.1255	-105.5464	0.737	-116.1255	0.240494	7.065342	0.038749
☐	☐	ARMA(2, 2)	29	0.0019203	-109.0574	-101.4256	0.755	-119.0574	0.140988	6.781232	0.037383
☐	☐	ARMA(2, 1)	30	0.0020578	-108.1267	-102.0213	0.737	-116.1267	0.088530	7.067188	0.038769
☐	☐	ARIMA(2, 1, 1	29	0.001994	-106.7575	-100.7715	0.794	-114.7575	0.044643	5.510006	0.032610
☐	☐	ARMA(1, 1)	31	0.0022253	-106.6171	-102.0380	0.724	-112.6171	0.041617	7.185597	0.040250
☐	☐	MA(2)	31	0.0023141	-104.7849	-100.2058	0.704	-110.7849	0.016650	7.834975	0.041898
☐	☐	IMA(1, 2)	30	0.0022244	-104.5090	-100.0195	0.764	-110.509	0.014505	6.127581	0.036155
☐	☐	ARI(1, 1)	31	0.0023774	-103.6150	-100.6220	0.740	-107.615	0.009276	6.601567	0.038717
☐	☐	ARIMA(2, 1, 2	28	0.0019306	-103.5873	-96.10475	0.784	-113.5873	0.009149	5.820564	0.033769
☐	☐	IMA(1, 1)	31	0.0023959	-103.3985	-100.4054	0.738	-107.3985	0.008324	6.630972	0.038715
☐	☐	ARI(2, 1)	30	0.0023381	-103.1566	-98.66709	0.752	-109.1566	0.007376	6.422783	0.037585
☐	☐	ARIMA(1, 1, 2	29	0.002264	-103.0466	-97.06053	0.768	-111.0466	0.006981	6.192708	0.036466
☐	☐	ARIMA(1, 1, 1	30	0.002417	-102.1318	-97.64224	0.744	-108.1318	0.004419	6.555348	0.038409
☐	☐	AR(1)	32	0.0026565	-101.8357	-98.78299	0.681	-105.8357	0.003811	7.526164	0.042492
☐	☐	I(1)	32	0.0027467	-99.97798	-98.48147	0.690	-101.978	0.001505	7.216923	0.042216
☐	☐	ARIMA(1, 2, 1	29	0.0024825	-95.64615	-91.24894	0.687	-101.6461	0.000173	6.967480	0.040999
☐	☐	IMA(2, 2)	29	0.0024808	-95.27485	-90.87764	0.685	-101.2748	0.000143	7.117674	0.041651
☐	☐	ARIMA(2, 2, 1	28	0.0024331	-94.95536	-89.09241	0.701	-102.9554	0.000122	6.917562	0.040611
☐	☐	ARIMA(1, 2, 2	28	0.0025266	-94.09909	-88.23614	0.692	-102.0991	0.000080	6.919958	0.040678
☐	☐	ARIMA(2, 2, 2	27	0.0026471	-91.89121	-84.56253	0.690	-101.8912	0.000026	7.023389	0.041348
☐	☐	I(2)	31	0.0032921	-91.12349	-89.65775	0.590	-93.12349	0.000018	7.154151	0.042411
☐	☐	IMA(2, 1)	30	0.0033067	-89.99074	-87.05927	0.601	-93.99074	0.000010	7.284096	0.043082
☐	☐	ARI(1, 2)	30	0.0033258	-89.82542	-86.89394	0.599	-93.82542	0.000009	7.223691	0.042731
☐	☐	ARI(2, 2)	29	0.003435	-87.87312	-83.47592	0.600	-93.87312	0.000004	7.189074	0.042532
☐	☐	MA(1)	32	0.0042424	-86.47491	-83.42219	0.525	-90.47491	0.000002	10.065200	0.054035
☐	☐	ARIMA(0, 0, 0	33	0.0094795	-60.92052	-59.39416	-0.00	-62.92052	0.000000	14.460372	0.077300



Model: ARMA(1, 2)

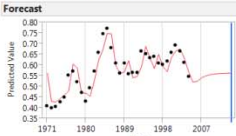
Model Summary

DF	30	Stable	Yes
Sum of Squared Errors	0.05595946	Invertible	Yes
Variance Estimate	0.00186532		
Standard Deviation	0.0431893		
Akaike's 'A' Information Criterion	-110.93862		
Schwarz's Bayesian Criterion	-104.83318		
RSquare	0.75544132		
RSquare Adj	0.73098545		
MAPE	6.69396121		
MAE	0.03700611		
-2LogLikelihood	-118.93862		

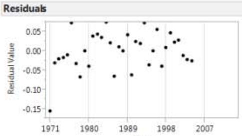
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	0.5977712	0.1617732	3.70	0.0009*	0.22710781
MA1	1	-0.7306087	0.1483586	-4.92	<.0001*	
MA2	2	-0.5797417	0.2191587	-2.65	0.0129*	
Intercept	0	0.5646234	0.0378581	14.91	<.0001*	

Forecast

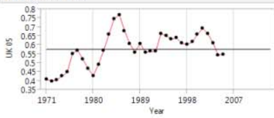


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0552	0.1129	0.7369	1	0.0552
2	-0.0136	0.1200	0.9418	2	-0.0167
3	0.0009	0.1200	0.9893	3	0.0026
4	-0.0526	0.2328	0.9937	4	-0.0532
5	-0.1756	1.5338	0.9091	5	-0.1706
6	0.0404	1.6050	0.9522	6	0.0586
7	0.1515	2.6450	0.9158	7	0.1469
8	0.1857	4.2676	0.8322	8	0.1805
9	0.0938	4.6988	0.8597	9	0.0708
10	-0.1876	6.4928	0.7723	10	-0.2437
11	-0.1150	7.1972	0.7829	11	-0.1022
12	0.0009	7.1972	0.8443	12	0.0815
13	-0.2015	9.5644	0.7291	13	-0.1384
14	-0.0649	9.8220	0.7751	14	-0.0819
15	0.1023	10.4967	0.7874	15	-0.0375
16	0.0099	10.5034	0.8391	16	-0.0585
17	0.1814	12.8738	0.7446	17	0.2930
18	-0.1123	13.8390	0.7395	18	-0.1195
19	0.0808	14.3717	0.7616	19	0.1531
20	-0.0446	14.5453	0.8018	20	-0.0534
21	-0.1945	18.1057	0.6423	21	-0.2349
22	-0.1928	21.8986	0.4660	22	-0.0611
23	0.0745	22.5169	0.4893	23	-0.0492
24	0.0107	22.5310	0.5476	24	-0.0669
25	-0.0622	23.0578	0.5742	25	-0.0899

Time Series UK 05



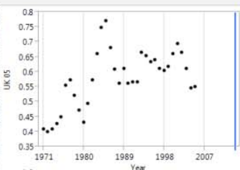
Mean	0.5770159
Std	0.094659
N	35
Zero Mean ADF	0.1298112
Single Mean ADF	-2.114573
Trend ADF	-1.707979

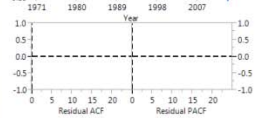
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8128	25.1619	<.0001*	1	0.8128
2	0.5088	35.3204	<.0001*	2	-0.4474
3	0.2223	37.3203	<.0001*	3	-0.0465
4	0.0663	37.5037	<.0001*	4	0.1733
5	0.0229	37.5264	<.0001*	5	0.0101
6	0.1044	38.0131	<.0001*	6	0.2393
7	0.2104	40.0611	<.0001*	7	-0.0053
8	0.2312	42.6248	<.0001*	8	-0.1913
9	0.1245	43.3970	<.0001*	9	-0.1380
10	-0.0500	43.5265	<.0001*	10	-0.0844
11	-0.1823	45.3207	<.0001*	11	0.0873
12	-0.2417	48.6097	<.0001*	12	-0.0541
13	-0.2484	52.2419	<.0001*	13	-0.1663
14	-0.1742	54.1124	<.0001*	14	0.1481
15	-0.0341	54.1878	<.0001*	15	0.1627
16	0.0741	54.5619	<.0001*	16	-0.0340
17	0.0960	55.2254	<.0001*	17	-0.0029
18	0.0006	55.2254	<.0001*	18	-0.2812
19	-0.1014	56.0573	<.0001*	19	0.1313
20	-0.2150	60.0486	<.0001*	20	-0.1559
21	-0.2787	67.2346	<.0001*	21	-0.0698
22	-0.2793	75.0081	<.0001*	22	-0.0174
23	-0.1960	79.1543	<.0001*	23	-0.1095
24	-0.1267	81.0447	<.0001*	24	-0.0523
25	-0.1129	82.6961	<.0001*	25	0.0239

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARMA(1, 2)	31	0.0018313	-115.0999	-108.8785	0.751	-123.0999	0.376832	6.707186	0.036961
☐	☐	AR(2)	32	0.0019671	-114.0068	-109.3407	0.731	-120.0068	0.218163	7.075837	0.038725
☐	☐	ARMA(2, 2)	30	0.0018856	-113.1856	-105.4088	0.750	-123.1856	0.144695	6.745396	0.037094
☐	☐	ARMA(2, 1)	31	0.00203	-112.0157	-105.7943	0.731	-120.0157	0.080617	7.077068	0.038754
☐	☐	ARIMA(2, 1, 1	30	0.0019268	-111.2722	-105.1667	0.795	-119.2722	0.055585	5.368112	0.031765
☐	☐	ARMA(1, 1)	32	0.0021681	-110.8119	-106.1458	0.721	-116.8119	0.044158	7.113009	0.039756
☐	☐	MA(2)	32	0.0022413	-109.1223	-104.4562	0.705	-115.1223	0.018972	7.616593	0.040733
☐	☐	IMA(1, 2)	31	0.002189	-108.3504	-103.7714	0.761	-114.3504	0.012898	6.111612	0.036006
☐	☐	ARI(1, 1)	32	0.0023284	-107.5448	-104.4921	0.738	-111.5448	0.008621	6.568109	0.038438
☐	☐	IMA(1, 1)	32	0.002333	-107.5018	-104.4491	0.738	-111.5018	0.008438	6.543519	0.038164
☐	☐	ARI(2, 1)	31	0.0022763	-107.2870	-102.7079	0.752	-113.287	0.007579	6.341210	0.037045
☐	☐	ARIMA(1, 1, 2	30	0.0022154	-107.0585	-100.9531	0.766	-115.0585	0.006761	6.165395	0.036257
☐	☐	ARIMA(2, 1, 2	29	0.0021256	-107.0241	-99.39234	0.779	-117.0241	0.006645	5.891481	0.034257
☐	☐	ARIMA(1, 1, 1	31	0.0023628	-106.1035	-101.5244	0.743	-112.1035	0.004194	6.517328	0.038108
☐	☐	AR(1)	33	0.0025761	-105.9998	-102.8891	0.681	-109.9998	0.003982	7.329811	0.041373
☐	☐	I(1)	33	0.0026635	-104.0832	-102.5568	0.691	-106.0832	0.001527	7.006546	0.040985
☐	☐	IMA(2, 2)	30	0.002433	-99.03846	-94.54894	0.683	-105.0385	0.000123	7.078753	0.041327
☐	☐	ARIMA(2, 2, 1	29	0.0023822	-98.71739	-92.73136	0.699	-106.7174	0.000104	6.913625	0.040457
☐	☐	ARIMA(1, 2, 2	29	0.0024864	-97.68187	-91.69584	0.688	-105.6819	0.000062	6.966754	0.040820
☐	☐	ARIMA(2, 2, 2	28	0.0025808	-95.51898	-88.03644	0.686	-105.519	0.000021	7.016426	0.041166
☐	☐	I(2)	32	0.0033451	-93.47432	-91.97781	0.572	-95.47432	0.000008	7.232534	0.042839
☐	☐	IMA(2, 1)	31	0.0033413	-92.49894	-89.50593	0.586	-96.49894	0.000005	7.430152	0.043865
☐	☐	ARI(1, 2)	31	0.0033724	-92.23054	-89.23752	0.582	-96.23054	0.000004	7.306140	0.043148
☐	☐	ARIMA(1, 2, 1	30	0.0034557	-90.52992	-86.04040	0.586	-96.52992	0.000002	7.417580	0.044042
☐	☐	ARI(2, 2)	30	0.0034741	-90.32556	-85.83604	0.584	-96.32556	0.000002	7.297916	0.043105
☐	☐	MA(1)	33	0.0041141	-90.17269	-87.06199	0.526	-94.17269	0.000001	9.793221	0.052566
☐	☐	ARIMA(0, 0, 0	34	0.0092239	-63.69752	-62.14217	0.000	-65.69752	0.000000	14.171422	0.075882





Model: ARMA(1, 2)

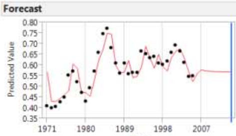
Model Summary

DF	31	Stable	Yes
Sum of Squared Errors	0.05677181	Invertible	Yes
Variance Estimate	0.00183135		
Standard Deviation	0.04279426		
Akaike's 'A' Information Criterion	-115.09991		
Schwarz's Bayesian Criterion	-108.87851		
RSquare	0.75062207		
RSquare Adj	0.72648873		
MAPE	6.70718584		
MAE	0.03696061		
-2LogLikelihood	-123.09991		

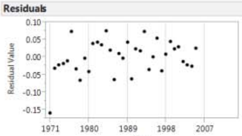
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	0.5917009	0.1601940	3.69	0.0008*	0.23217741
MA1	1	-0.7309283	0.1545210	-4.73	<.0001*	
MA2	2	-0.5629387	0.1941013	-2.90	0.0068*	
Intercept	0	0.5686454	0.0361778	15.72	<.0001*	

Forecast

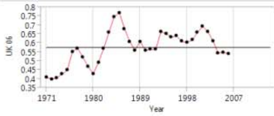


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0489	0.0910	0.7630	1	0.0489
2	-0.0084	0.0937	0.9542	2	-0.0108
3	-0.0103	0.0980	0.9921	3	-0.0094
4	-0.0437	0.1779	0.9963	4	-0.0429
5	-0.1651	1.3541	0.9293	5	-0.1617
6	0.0544	1.4860	0.9604	6	0.0704
7	0.1526	2.5635	0.9222	7	0.1478
8	0.1687	3.9286	0.8635	8	0.1600
9	0.1110	4.5423	0.8722	9	0.0958
10	-0.1842	6.3002	0.7894	10	-0.2315
11	-0.1296	7.2069	0.7821	11	-0.1120
12	0.0197	7.2288	0.8421	12	0.0932
13	-0.1958	9.4861	0.7353	13	-0.1590
14	-0.0567	9.6846	0.7849	14	-0.0674
15	0.0807	10.1064	0.8130	15	-0.0495
16	0.0242	10.1462	0.8589	16	-0.0473
17	0.1795	12.4645	0.7712	17	0.2975
18	-0.1090	13.3701	0.7691	18	-0.1270
19	0.0605	13.6662	0.8028	19	0.1443
20	-0.0422	13.8197	0.8395	20	-0.0294
21	-0.1633	16.2865	0.7533	21	-0.2291
22	-0.1799	19.5114	0.6136	22	-0.0106
23	0.0857	20.3046	0.6235	23	-0.0503
24	0.0260	20.3841	0.6747	24	-0.0818
25	-0.0726	21.0660	0.6889	25	-0.0844

Time Series UK 06



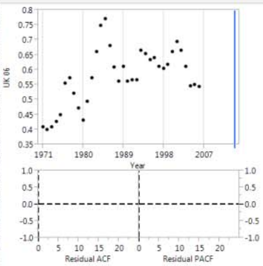
Mean	0.5760565
Std	0.0935075
N	36
Zero Mean ADF	0.1087119
Single Mean ADF	-2.129891
Trend ADF	-1.700041

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8133	25.8559	<.0001*	1	0.8133
2	0.5115	36.3827	<.0001*	2	-0.4432
3	0.2194	38.3784	<.0001*	3	-0.0754
4	0.0584	38.5242	<.0001*	4	0.1883
5	0.0121	38.5306	<.0001*	5	0.0120
6	0.0968	38.9583	<.0001*	6	0.2432
7	0.2068	40.9754	<.0001*	7	-0.0078
8	0.2292	43.5411	<.0001*	8	-0.2110
9	0.1223	44.2990	<.0001*	9	-0.1347
10	-0.0545	44.4555	<.0001*	10	-0.0830
11	-0.1855	46.3391	<.0001*	11	0.1152
12	-0.2469	49.8146	<.0001*	12	-0.0718
13	-0.2555	53.6988	<.0001*	13	-0.1868
14	-0.1714	55.5261	<.0001*	14	0.2046
15	-0.0324	55.5946	<.0001*	15	0.1012
16	0.0757	55.9864	<.0001*	16	0.0007
17	0.0920	56.5960	<.0001*	17	-0.0226
18	0.0022	56.5964	<.0001*	18	-0.2835
19	-0.1047	57.4788	<.0001*	19	0.1168
20	-0.2258	61.8393	<.0001*	20	-0.1627
21	-0.2994	70.0149	<.0001*	21	-0.0791
22	-0.2981	78.6978	<.0001*	22	0.0288
23	-0.2062	83.1706	<.0001*	23	-0.1452
24	-0.1280	85.0384	<.0001*	24	-0.0161
25	-0.1059	86.4318	<.0001*	25	0.0107

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARMA(1, 2)	32	0.0017853	-119.4877	-113.1536	0.753	-127.4877	0.389724	6.576910	0.036310
☐	☐	AR(2)	33	0.001913	-118.3981	-113.6476	0.733	-124.3981	0.226025	6.925037	0.037951
☐	☐	ARMA(2, 2)	31	0.0018375	-117.5580	-109.6404	0.752	-127.558	0.148503	6.617883	0.036472
☐	☐	ARMA(2, 1)	32	0.0019727	-116.4000	-110.0659	0.733	-124.4	0.083228	6.926283	0.037969
☐	☐	ARMA(1, 1)	33	0.0021101	-115.0755	-110.3249	0.723	-121.0755	0.042919	6.962303	0.038967
☐	☐	ARIMA(2, 1, 1	31	0.0019416	-114.5970	-108.3756	0.788	-122.597	0.033787	5.505599	0.032432
☐	☐	MA(2)	33	0.0021771	-113.3523	-108.6017	0.706	-119.3523	0.018133	7.480752	0.040046
☐	☐	IMA(1, 2)	32	0.0021297	-112.6056	-107.9395	0.761	-118.6056	0.012483	6.025135	0.035467
☐	☐	ARI(1, 1)	33	0.0022612	-111.7925	-108.6818	0.739	-115.7925	0.008313	6.433798	0.037632
☐	☐	IMA(1, 1)	33	0.0022717	-111.6588	-108.5481	0.738	-115.6588	0.007776	6.444765	0.037554
☐	☐	ARIMA(1, 1, 2	31	0.0021517	-111.3540	-105.1326	0.766	-119.354	0.006676	6.073114	0.035683
☐	☐	ARI(2, 1)	32	0.0022272	-111.3148	-106.6488	0.751	-117.3148	0.006547	6.300255	0.036760
☐	☐	ARIMA(2, 1, 2	30	0.0020776	-111.2937	-103.5169	0.779	-121.2937	0.006478	5.825520	0.033923
☐	☐	ARIMA(1, 1, 1	32	0.0022964	-110.3091	-105.6431	0.743	-116.3091	0.003960	6.408739	0.037446
☐	☐	AR(1)	34	0.0025012	-110.1761	-107.0090	0.683	-114.1761	0.003705	7.157926	0.040416
☐	☐	I(1)	34	0.0025886	-108.1712	-106.6159	0.692	-110.1712	0.001360	6.861648	0.040118
☐	☐	ARIMA(1, 2, 1	31	0.0023685	-103.4371	-98.85804	0.685	-109.4371	0.000127	6.798956	0.039875
☐	☐	IMA(2, 2)	31	0.0023552	-103.2897	-98.71061	0.685	-109.2897	0.000118	6.896226	0.040252
☐	☐	ARIMA(2, 2, 1	30	0.00231	-102.9467	-96.84121	0.700	-110.9467	0.000100	6.785049	0.039682
☐	☐	ARIMA(2, 2, 2	29	0.0024545	-99.77979	-92.14798	0.688	-109.7798	0.000020	6.828782	0.040049
☐	☐	I(2)	33	0.0032473	-97.34494	-95.81858	0.575	-99.34494	0.000006	7.092461	0.041961
☐	☐	IMA(2, 1)	32	0.003238	-96.43176	-93.37904	0.589	-100.4318	0.000004	7.219924	0.042616
☐	☐	ARI(1, 2)	32	0.003267	-96.16232	-93.10960	0.586	-100.1623	0.000003	7.091730	0.041882
☐	☐	ARIMA(1, 2, 2	30	0.0028121	-95.92303	-89.81759	0.633	-103.923	0.000003	7.232257	0.042013
☐	☐	ARI(2, 2)	31	0.0033621	-94.26040	-89.68132	0.587	-100.2604	0.000001	7.083568	0.041839
☐	☐	MA(1)	34	0.0040284	-93.59329	-90.42626	0.525	-97.59329	0.000001	9.684857	0.052113
☐	☐	ARIMA(0, 0, 0	35	0.0089935	-66.45584	-64.87232	0.000	-68.45584	0.000000	13.922195	0.074681



Model: ARMA(1, 2)

Model Summary

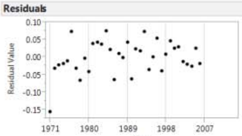
DF	32	Stable	Yes
Sum of Squared Errors	0.05712999	Invertible	Yes
Variance Estimate	0.00178531		
Standard Deviation	0.04225295		
Akaike's 'A' Information Criterion	-119.4877		
Schwarz's Bayesian Criterion	-113.15362		
RSquare	0.75275514		
RSquare Adj	0.72957594		
MAPE	6.57690977		
MAE	0.03630984		
-2LogLikelihood	-127.4877		

Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	0.5974198	0.1571357	3.80	0.0006*	0.22781537
MA1	1	-0.7195902	0.1513684	-4.75	<.0001*	
MA2	2	-0.5577821	0.1925581	-2.90	0.0067*	
Intercept	0	0.5658882	0.0355751	15.91	<.0001*	

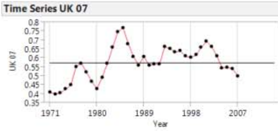
Forecast

Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0467	0.0852	0.7703	1	0.0467
2	-0.0074	0.0875	0.9572	2	-0.0096
3	-0.0098	0.0915	0.9928	3	-0.0091
4	-0.0376	0.1521	0.9973	4	-0.0369
5	-0.1718	1.4542	0.9183	5	-0.1691
6	0.0446	1.5450	0.9565	6	0.0607
7	0.1457	2.5459	0.9236	7	0.1422
8	0.1714	3.9808	0.8588	8	0.1639
9	0.1189	4.6965	0.8599	9	0.1057
10	-0.1954	6.7058	0.7529	10	-0.2486
11	-0.1293	7.6210	0.7468	11	-0.1185
12	0.0300	7.6724	0.8102	12	0.1069
13	-0.2088	10.2655	0.6721	13	-0.1663
14	-0.0640	10.5200	0.7233	14	-0.0639
15	0.0735	10.8720	0.7616	15	-0.0624
16	0.0440	11.0044	0.8092	16	-0.0321
17	0.1690	13.0615	0.7321	17	0.2954
18	-0.1076	13.9408	0.7329	18	-0.1333
19	0.0576	14.2075	0.7715	19	0.1375
20	-0.0269	14.2695	0.8166	20	-0.0169
21	-0.1687	16.8660	0.7192	21	-0.2433
22	-0.1977	20.6853	0.5403	22	-0.0086
23	0.0763	21.2976	0.5629	23	-0.0727
24	0.0183	21.3358	0.6188	24	-0.1007
25	-0.0810	22.1514	0.6270	25	-0.0787

Time Series UK 07



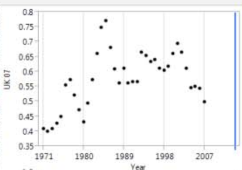
Mean	0.5739874
Std	0.0930669
N	37
Zero Mean ADF	-0.023199
Single Mean ADF	-2.063077
Trend ADF	-1.489377

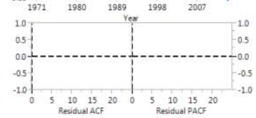
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8080	26.1658	<.0001*	1	0.8080
2	0.5112	36.9395	<.0001*	2	-0.4078
3	0.2264	39.1158	<.0001*	3	-0.0881
4	0.0536	39.2416	<.0001*	4	0.1136
5	-0.0041	39.2423	<.0001*	5	0.0538
6	0.0717	39.4817	<.0001*	6	0.2274
7	0.1873	41.1684	<.0001*	7	0.0284
8	0.2189	43.5535	<.0001*	8	-0.1965
9	0.1180	44.2704	<.0001*	9	-0.1919
10	-0.0567	44.4424	<.0001*	10	-0.0806
11	-0.1923	46.4945	<.0001*	11	0.1083
12	-0.2513	50.1388	<.0001*	12	0.0074
13	-0.2653	54.3695	<.0001*	13	-0.2128
14	-0.1874	56.5730	<.0001*	14	0.1058
15	-0.0289	56.6278	<.0001*	15	0.2323
16	0.0767	57.0325	<.0001*	16	-0.0888
17	0.0939	57.6686	<.0001*	17	-0.0034
18	-0.0060	57.6714	<.0001*	18	-0.2886
19	-0.0998	58.4702	<.0001*	19	0.1266
20	-0.2302	62.9674	<.0001*	20	-0.1951
21	-0.3197	72.1846	<.0001*	21	-0.0831
22	-0.3404	83.3311	<.0001*	22	-0.0747
23	-0.2465	89.5952	<.0001*	23	0.0272
24	-0.1503	92.1012	<.0001*	24	-0.0640
25	-0.1085	93.5168	<.0001*	25	0.0087

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	ARMA(1, 2)	33	0.0018159	-122.3843	-115.9406	0.754	-130.3843	0.354942	6.666341	0.036838
☐	☐	AR(2)	34	0.0019153	-121.7556	-116.9228	0.736	-127.7556	0.259201	6.899226	0.037858
☐	☐	ARMA(2, 2)	32	0.0018709	-120.4062	-112.3516	0.754	-130.4062	0.132016	6.685773	0.036913
☐	☐	ARMA(2, 1)	33	0.0019727	-119.7666	-113.3230	0.736	-127.7666	0.095885	6.901304	0.037897
☐	☐	ARMA(1, 1)	34	0.0020915	-118.6903	-113.8576	0.728	-124.6903	0.055979	6.917809	0.038735
☐	☐	ARIMA(2, 1, 1	32	0.002026	-116.6877	-110.3536	0.777	-124.6877	0.020567	5.757197	0.033581
☐	☐	MA(2)	34	0.0021966	-116.3484	-111.5156	0.706	-122.3484	0.017357	7.507227	0.040261
☐	☐	IMA(1, 2)	33	0.0021385	-115.8017	-111.0512	0.759	-121.8017	0.013206	6.143238	0.035936
☐	☐	ARI(1, 1)	34	0.002246	-115.2833	-112.1162	0.739	-119.2833	0.010191	6.473097	0.037683
☐	☐	IMA(1, 1)	34	0.0022512	-115.2251	-112.0580	0.738	-119.2251	0.009898	6.476145	0.037566
☐	☐	ARI(2, 1)	33	0.0022104	-114.8460	-110.0955	0.751	-120.846	0.008189	6.350338	0.036884
☐	☐	ARIMA(1, 1, 2	32	0.0021599	-114.5322	-108.1981	0.763	-122.5322	0.007000	6.203149	0.036212
☐	☐	ARIMA(1, 1, 1	33	0.0022762	-113.8537	-109.1031	0.743	-119.8537	0.004986	6.441822	0.037464
☐	☐	AR(1)	35	0.002482	-113.5893	-110.3675	0.687	-117.5893	0.004369	7.168097	0.040440
☐	☐	ARIMA(2, 1, 2	31	0.0019567	-113.4275	-105.5099	0.768	-123.4275	0.004029	6.078146	0.034987
☐	☐	I(1)	35	0.0025754	-111.4731	-109.8895	0.692	-113.4731	0.001516	6.926618	0.040302
☐	☐	ARIMA(1, 2, 1	32	0.0023229	-107.2856	-102.6195	0.690	-113.2856	0.000187	6.793218	0.039695
☐	☐	IMA(2, 2)	32	0.0023026	-107.2641	-102.5981	0.691	-113.2641	0.000185	6.840994	0.039831
☐	☐	ARIMA(2, 2, 1	31	0.002257	-106.9323	-100.7109	0.706	-114.9323	0.000157	6.742957	0.039325
☐	☐	ARIMA(1, 2, 2	31	0.002352	-105.8579	-99.63649	0.696	-113.8579	0.000092	6.741092	0.039359
☐	☐	ARIMA(2, 2, 2	30	0.0024636	-103.4908	-95.71401	0.692	-113.4908	0.000028	6.861909	0.040090
☐	☐	I(2)	34	0.0031892	-100.8680	-99.31264	0.582	-102.868	0.000008	7.130627	0.041944
☐	☐	IMA(2, 1)	33	0.0031745	-100.0085	-96.89776	0.596	-104.0085	0.000005	7.283242	0.042779
☐	☐	ARI(1, 2)	33	0.0032101	-99.66236	-96.55166	0.592	-103.6624	0.000004	7.144221	0.041954
☐	☐	ARI(2, 2)	32	0.0032901	-97.86646	-93.20041	0.594	-103.8665	0.000002	7.097336	0.041719
☐	☐	MA(1)	35	0.0039766	-96.72660	-93.50477	0.527	-100.7266	0.000001	9.679357	0.052164
☐	☐	ARIMA(0, 0, 0	36	0.008902	-68.70686	-67.09594	0.000	-70.70686	0.000000	13.880884	0.074564





Model: ARMA(1, 2)

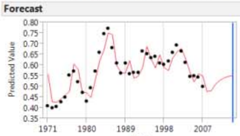
Model Summary

DF	33	Stable	Yes
Sum of Squared Errors	0.05992601	Invertible	Yes
Variance Estimate	0.00181594		
Standard Deviation	0.04261384		
Akaike's 'A' Information Criterion	-122.38425		
Schwarz's Bayesian Criterion	-115.94058		
RSquare	0.75425816		
RSquare Adj	0.73191799		
MAPE	6.66634127		
MAE	0.03683806		
-2LogLikelihood	-130.38425		

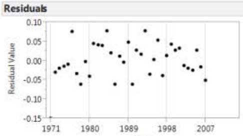
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	0.6065542	0.1615787	3.75	0.0007*	0.21977534
MA1	1	-0.7332235	0.1675702	-4.38	0.0001*	
MA2	2	-0.5272949	0.1815790	-2.90	0.0065*	
Intercept	0	0.5585912	0.0363355	15.37	<.0001*	

Forecast

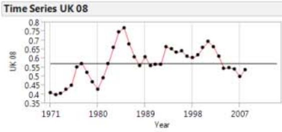


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0419	0.0704	0.7907	1	0.0419
2	-0.0010	0.0705	0.9654	2	-0.0027
3	-0.0062	0.0721	0.9950	3	-0.0060
4	-0.0274	0.1049	0.9987	4	-0.0269
5	-0.1454	1.0577	0.9578	5	-0.1435
6	0.0236	1.0836	0.9822	6	0.0358
7	0.1207	1.7839	0.9708	7	0.1203
8	0.1464	2.8506	0.9434	8	0.1399
9	0.1089	3.4612	0.9432	9	0.0975
10	-0.1567	4.7729	0.9058	10	-0.1954
11	-0.1549	6.1038	0.8664	11	-0.1547
12	0.0311	6.1595	0.9078	12	0.0865
13	-0.1795	8.0968	0.8372	13	-0.1412
14	-0.1043	8.7790	0.8449	14	-0.0990
15	0.0569	8.9912	0.8780	15	-0.0283
16	0.0224	9.0259	0.9123	16	-0.0570
17	0.2138	12.3248	0.7801	17	0.3029
18	-0.1372	13.7539	0.7450	18	-0.1554
19	0.0609	14.0514	0.7807	19	0.1200
20	-0.0377	14.1721	0.8217	20	-0.0188
21	-0.1206	15.4838	0.7979	21	-0.1736
22	-0.1984	19.2699	0.6286	22	-0.0531
23	0.0155	19.2946	0.6840	23	-0.0914
24	-0.0094	19.3043	0.7356	24	-0.1498
25	-0.0989	20.4800	0.7212	25	-0.1356

Time Series UK 08



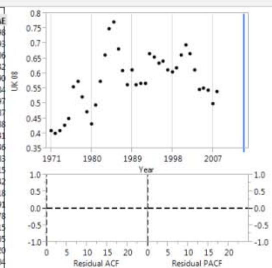
Mean	0.5730727
Std	0.0920026
N	38
Zero Mean ADF	0.0879339
Single Mean ADF	-2.169682
Trend ADF	-1.787748

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8135	27.1876	<.0001*	1	0.8135
2	0.5139	38.3380	<.0001*	2	-0.4373
3	0.2300	40.6357	<.0001*	3	-0.0552
4	0.0587	40.7899	<.0001*	4	0.1166
5	-0.0055	40.7913	<.0001*	5	0.0176
6	0.0641	40.9867	<.0001*	6	0.2526
7	0.1759	42.5033	<.0001*	7	0.0084
8	0.2110	44.7590	<.0001*	8	-0.1932
9	0.1149	45.4511	<.0001*	9	-0.1810
10	-0.0572	45.6289	<.0001*	10	-0.0948
11	-0.1929	47.7246	<.0001*	11	0.1149
12	-0.2551	51.5280	<.0001*	12	-0.0075
13	-0.2687	55.9164	<.0001*	13	-0.1917
14	-0.1938	58.2960	<.0001*	14	0.1215
15	-0.0381	58.3920	<.0001*	15	0.1974
16	0.0774	58.8054	<.0001*	16	-0.0717
17	0.0944	59.4504	<.0001*	17	-0.0261
18	-0.0045	59.4520	<.0001*	18	-0.2699
19	-0.1034	60.3081	<.0001*	19	0.1263
20	-0.2281	64.7013	<.0001*	20	-0.1921
21	-0.3225	73.9980	<.0001*	21	-0.1271
22	-0.3509	85.6949	<.0001*	22	-0.0435
23	-0.2676	92.9514	<.0001*	23	-0.0149
24	-0.1700	96.0897	<.0001*	24	-0.0212
25	-0.1195	97.7602	<.0001*	25	0.0091

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	35	0.0019257	-125.0460	-120.1332	0.726	-131.046	0.314488	7.031643	0.038398
☐	☐	ARMA(1, 2)	34	0.001879	-124.7902	-118.2398	0.738	-132.7902	0.276724	6.870141	0.037693
☐	☐	ARMA(2, 1)	34	0.0019823	-123.0462	-116.4959	0.726	-131.0462	0.115707	7.032285	0.038406
☐	☐	ARMA(2, 2)	33	0.001935	-122.8054	-114.6174	0.738	-132.8054	0.102578	6.882989	0.037742
☐	☐	ARMA(1, 1)	35	0.0020899	-122.1171	-117.2043	0.718	-128.1171	0.072711	7.041840	0.039190
☐	☐	ARIMA(2, 1, 1	33	0.0019945	-120.5253	-114.0816	0.775	-128.5253	0.032805	5.752600	0.033484
☐	☐	MA(2)	35	0.0021836	-119.8809	-114.9682	0.700	-125.8809	0.023770	7.544687	0.040397
☐	☐	IMA(1, 1)	35	0.0022612	-118.3269	-115.1051	0.731	-122.3269	0.010929	6.569792	0.037987
☐	☐	ARI(1, 1)	35	0.0022665	-118.2299	-115.0080	0.730	-122.2299	0.010411	6.586695	0.038188
☐	☐	IMA(1, 2)	34	0.0022183	-117.9155	-113.0827	0.743	-123.9155	0.008897	6.405909	0.037241
☐	☐	ARI(2, 1)	34	0.0022375	-117.6935	-112.8608	0.741	-123.6935	0.007962	6.457976	0.037346
☐	☐	AR(1)	36	0.0024473	-117.3263	-114.0512	0.681	-121.3263	0.006627	7.164765	0.040283
☐	☐	ARIMA(1, 1, 1	34	0.0022993	-116.7487	-111.9159	0.734	-122.7487	0.004964	6.563077	0.038015
☐	☐	ARIMA(1, 1, 2	33	0.0022422	-116.5692	-110.1256	0.748	-124.5692	0.004538	6.429831	0.037342
☐	☐	ARIMA(2, 1, 2	32	0.0021532	-116.4343	-108.3797	0.760	-126.4343	0.004242	6.085832	0.035318
☐	☐	I(1)	36	0.0025413	-115.0897	-113.4788	0.689	-117.0897	0.002166	6.924126	0.040191
☐	☐	IMA(2, 2)	33	0.0023555	-109.6458	-104.8952	0.678	-115.6458	0.000142	7.021023	0.040678
☐	☐	ARIMA(1, 2, 1	33	0.0023771	-109.6096	-104.8591	0.676	-115.6096	0.000140	6.969349	0.040515
☐	☐	ARIMA(2, 2, 1	32	0.002333	-108.9656	-102.6315	0.690	-116.9656	0.000101	6.935636	0.040205
☐	☐	ARIMA(1, 2, 2	32	0.0024125	-108.0873	-101.7532	0.681	-116.0873	0.000065	6.960586	0.040420
☐	☐	ARIMA(2, 2, 2	31	0.0025308	-105.6156	-97.69802	0.676	-115.6156	0.000019	6.966813	0.040504
☐	☐	I(2)	35	0.0032925	-102.6304	-101.0469	0.559	-104.6304	0.000004	7.282212	0.042748
☐	☐	IMA(2, 1)	34	0.0032356	-102.1980	-99.03096	0.579	-106.198	0.000003	7.459626	0.043715
☐	☐	ARI(1, 2)	34	0.0032885	-101.6871	-98.52011	0.572	-105.6871	0.000003	7.302961	0.042763
☐	☐	MA(1)	36	0.0038664	-100.4817	-97.20650	0.529	-104.4817	0.000001	9.443342	0.050881
☐	☐	ARI(2, 2)	33	0.0033624	-99.94773	-95.19717	0.576	-105.9477	0.000001	7.279988	0.042671
☐	☐	ARIMA(0, 0, 0	37	0.0086932	-71.49202	-69.85443	0.000	-73.49202	0.000000	13.646884	0.073421



Model: AR(2)

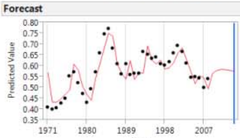
Model Summary

DF	35	Stable	Yes
Sum of Squared Errors	0.06739917	Invertible	Yes
Variance Estimate	0.00192569		
Standard Deviation	0.04388269		
Akaike's 'A' Information Criterion	-125.046		
Schwarz's Bayesian Criterion	-120.13325		
RSquare	0.72636435		
RSquare Adj	0.71072803		
MAPE	7.03164348		
MAE	0.03839827		
-2LogLikelihood	-131.046		

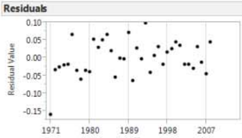
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.268120	0.1386172	9.15	<.0001*	0.12909783
AR2	2	-0.494716	0.1463348	-3.38	0.0018*	
Intercept	0	0.569726	0.0297413	19.16	<.0001*	

Forecast

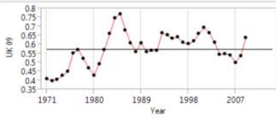


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0285	0.0335	0.8548	1	0.0285
2	0.0741	0.2651	0.8758	2	0.0733
3	-0.0975	0.6779	0.8784	3	-0.1022
4	0.0487	0.7840	0.9406	4	0.0501
5	-0.1326	1.5937	0.9020	5	-0.1235
6	0.0218	1.6163	0.9514	6	0.0157
7	0.1537	2.7740	0.9051	7	0.1853
8	0.2260	5.3627	0.7182	8	0.1944
9	0.0675	5.6013	0.7791	9	0.0542
10	-0.1459	6.7574	0.7481	10	-0.1854
11	-0.1570	8.1454	0.7002	11	-0.1676
12	0.0424	8.2504	0.7653	12	0.1141
13	-0.1262	9.2180	0.7563	13	-0.0802
14	-0.1671	10.9872	0.6870	14	-0.2308
15	0.0998	11.6455	0.7056	15	0.0429
16	0.0463	11.7936	0.7581	16	-0.0358
17	0.1876	14.3415	0.6428	17	0.2758
18	-0.2068	17.5920	0.4828	18	-0.1294
19	0.1070	18.5081	0.4888	19	0.0825
20	-0.0848	19.1160	0.5143	20	-0.0123
21	-0.0864	19.7830	0.5350	21	-0.1373
22	-0.2570	26.0560	0.2493	22	-0.1306
23	0.0159	26.0817	0.2970	23	-0.0768
24	0.0455	26.3069	0.3378	24	-0.0880
25	-0.0262	26.3874	0.3872	25	-0.1088

Time Series UK 09



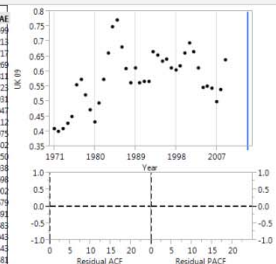
Mean	0.5747511
Std	0.0914028
N	39
Zero Mean ADF	0.3697288
Single Mean ADF	-2.213264
Trend ADF	-2.152868

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.7954	26.6242	<.0001*	1	0.7954
2	0.4906	37.0259	<.0001*	2	-0.3869
3	0.2178	39.1320	<.0001*	3	-0.0503
4	0.0491	39.2422	<.0001*	4	0.0505
5	-0.0158	39.2540	<.0001*	5	0.0344
6	0.0660	39.4650	<.0001*	6	0.2744
7	0.1873	41.2177	<.0001*	7	0.0144
8	0.2280	43.8993	<.0001*	8	-0.1402
9	0.1262	44.7488	<.0001*	9	-0.2174
10	-0.0523	44.8997	<.0001*	10	-0.1154
11	-0.1895	46.9499	<.0001*	11	0.1144
12	-0.2492	50.6276	<.0001*	12	0.0105
13	-0.2559	54.6564	<.0001*	13	-0.1417
14	-0.1823	56.7819	<.0001*	14	0.0200
15	-0.0234	56.8182	<.0001*	15	0.1966
16	0.0942	57.4354	<.0001*	16	0.0200
17	0.0917	58.0461	<.0001*	17	-0.0995
18	-0.0062	58.0490	<.0001*	18	-0.1612
19	-0.1047	58.9262	<.0001*	19	0.0160
20	-0.2179	62.9221	<.0001*	20	-0.1182
21	-0.3208	72.0619	<.0001*	21	-0.1627
22	-0.3392	82.8845	<.0001*	22	-0.0417
23	-0.2420	88.7352	<.0001*	23	0.0426
24	-0.1267	90.4464	<.0001*	24	0.0079
25	-0.0801	91.1792	<.0001*	25	-0.0685

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	36	0.0020064	-126.7781	-121.7874	0.707	-132.7781	0.295250	7.261789	0.039599
☐	☐	ARMA(1, 2)	35	0.0019511	-126.6383	-119.9840	0.720	-134.6383	0.275308	7.154570	0.039213
☐	☐	ARMA(2, 1)	35	0.0020616	-124.8202	-118.1659	0.708	-132.8202	0.110924	7.274034	0.039717
☐	☐	ARMA(2, 2)	34	0.002007	-124.6596	-116.3418	0.720	-134.6596	0.102368	7.169632	0.039269
☐	☐	ARIMA(2, 1, 1	34	0.0018796	-123.8392	-117.2888	0.771	-131.8392	0.067921	5.779928	0.033811
☐	☐	ARMA(1, 1)	36	0.0021934	-123.5568	-118.5661	0.696	-129.5568	0.058979	7.320549	0.040723
☐	☐	MA(2)	36	0.0022127	-122.6179	-117.6272	0.690	-128.6179	0.036882	7.638777	0.040931
☐	☐	IMA(1, 1)	36	0.0023576	-119.9636	-116.6885	0.715	-123.9636	0.009782	6.724524	0.039047
☐	☐	ARI(2, 1)	35	0.0022997	-119.8465	-114.9337	0.729	-125.8465	0.009226	6.565230	0.038112
☐	☐	IMA(1, 2)	35	0.0023019	-119.6964	-114.7836	0.729	-125.6964	0.008559	6.509327	0.037975
☐	☐	ARI(1, 1)	36	0.0023841	-119.5311	-116.2560	0.712	-123.5311	0.007880	6.764409	0.039402
☐	☐	ARIMA(1, 1, 2	34	0.0023221	-118.4282	-111.8779	0.734	-126.4282	0.004540	6.563677	0.038250
☐	☐	ARIMA(1, 1, 1	35	0.0023931	-118.4255	-113.5128	0.718	-124.4255	0.004534	6.712310	0.039038
☐	☐	ARIMA(2, 1, 2	33	0.0022977	-117.7774	-109.5895	0.744	-127.7774	0.003279	6.323762	0.036698
☐	☐	AR(1)	37	0.0026397	-117.6169	-114.2898	0.647	-121.6169	0.003026	7.451810	0.041902
☐	☐	I(1)	37	0.0027141	-115.7275	-114.0899	0.663	-117.7275	0.001176	7.150364	0.041679
☐	☐	IMA(2, 2)	34	0.0024905	-110.7920	-105.9592	0.655	-116.792	0.000100	7.203622	0.041891
☐	☐	ARIMA(1, 2, 1	34	0.0025258	-110.6687	-105.8359	0.652	-116.6687	0.000094	7.136607	0.041683
☐	☐	ARIMA(2, 2, 1	33	0.0024324	-110.6011	-104.1574	0.672	-118.6011	0.000091	7.054209	0.041043
☐	☐	ARIMA(1, 2, 2	33	0.0025378	-109.4512	-103.0075	0.660	-117.4512	0.000051	7.107795	0.041443
☐	☐	ARIMA(2, 2, 2	32	0.0026354	-106.8284	-98.77379	0.654	-116.8284	0.000014	7.122489	0.041581
☐	☐	I(2)	36	0.0032926	-105.5073	-103.8964	0.552	-107.5073	0.000007	7.294023	0.043018
☐	☐	IMA(2, 1)	35	0.0033125	-104.2894	-101.0676	0.562	-108.2894	0.000004	7.339224	0.043231
☐	☐	ARI(1, 2)	35	0.0033345	-104.0669	-100.8451	0.559	-108.0669	0.000003	7.301091	0.043008
☐	☐	MA(1)	37	0.0038721	-103.1413	-99.81413	0.521	-107.1413	0.000002	9.467493	0.051060
☐	☐	ARI(2, 2)	34	0.003399	-102.4096	-97.57685	0.563	-108.4096	0.000002	7.298782	0.042997
☐	☐	ARIMA(0, 0, 0	38	0.0085743	-73.93614	-72.27258	-0.00	-75.93614	0.000000	13.621820	0.073345



Model: AR(2)

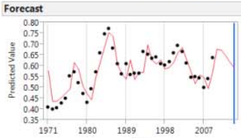
Model Summary

DF	36	Stable	Yes
Sum of Squared Errors	0.07223211	Invertible	Yes
Variance Estimate	0.00200645		
Standard Deviation	0.04479339		
Akaike's 'A' Information Criterion	-126.77812		
Schwarz's Bayesian Criterion	-121.78743		
RSquare	0.70749054		
RSquare Adj	0.69124002		
MAPE	7.26178882		
MAE	0.03959918		
-2LogLikelihood	-132.77812		

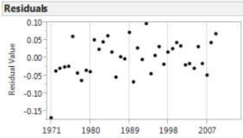
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.293068	0.1398760	9.24	<.0001*	0.14150253
AR2	2	-0.537712	0.1459915	-3.68	0.0008*	
Intercept	0	0.578403	0.0277217	20.86	<.0001*	

Forecast

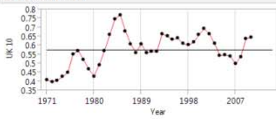


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0467	0.0916	0.7621	1	0.0467
2	0.0515	0.2061	0.9021	2	0.0494
3	-0.0778	0.4749	0.9244	3	-0.0828
4	0.1021	0.9508	0.9172	4	0.1082
5	-0.1270	1.7089	0.8878	5	-0.1327
6	0.0210	1.7302	0.9428	6	0.0211
7	0.1236	2.4937	0.9276	7	0.1556
8	0.2209	5.0104	0.7565	8	0.1783
9	0.0843	5.3894	0.7991	9	0.0881
10	-0.1233	6.2272	0.7958	10	-0.1639
11	-0.1306	7.2017	0.7825	11	-0.1417
12	0.0340	7.2701	0.8393	12	0.0704
13	-0.0898	7.7656	0.8585	13	-0.0700
14	-0.1496	9.1969	0.8182	14	-0.1552
15	0.0555	9.4024	0.8556	15	0.0205
16	0.0946	10.0245	0.8653	16	0.0048
17	0.1580	11.8378	0.8099	17	0.2091
18	-0.1904	14.5995	0.6893	18	-0.1396
19	0.0534	14.8274	0.7335	19	0.0719
20	-0.0277	14.8920	0.7826	20	0.0297
21	-0.0729	15.3647	0.8042	21	-0.1265
22	-0.2378	20.6817	0.5405	22	-0.1211
23	-0.0204	20.7233	0.5980	23	-0.0997
24	0.0460	20.9493	0.6417	24	-0.0435
25	0.0099	20.9605	0.6948	25	-0.0266

Time Series UK 10



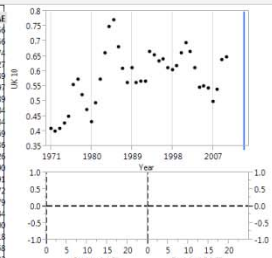
Mean	0.5765614
Std	0.0909584
N	40
Zero Mean ADF	0.398182
Single Mean ADF	-2.220619
Trend ADF	-2.185186

Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.7962	27.3071	<.0001*	1	0.7962
2	0.4737	37.2282	<.0001*	2	-0.4376
3	0.1953	38.9595	<.0001*	3	0.0050
4	0.0374	39.0248	<.0001*	4	0.0659
5	-0.0259	39.0570	<.0001*	5	-0.0236
6	0.0536	39.1988	<.0001*	6	0.3033
7	0.1873	40.9847	<.0001*	7	0.0294
8	0.2391	43.9852	<.0001*	8	-0.1619
9	0.1452	45.1270	<.0001*	9	-0.1615
10	-0.0384	45.2096	<.0001*	10	-0.1522
11	-0.1825	47.1393	<.0001*	11	0.1099
12	-0.2444	50.7224	<.0001*	12	0.0114
13	-0.2488	54.5745	<.0001*	13	-0.1411
14	-0.1686	56.4108	<.0001*	14	0.1001
15	-0.0123	56.4209	<.0001*	15	0.1083
16	0.1086	57.2467	<.0001*	16	-0.0069
17	0.1096	58.1239	<.0001*	17	-0.0304
18	-0.0082	58.1290	<.0001*	18	-0.2196
19	-0.1051	59.0135	<.0001*	19	0.1603
20	-0.2178	63.0000	<.0001*	20	-0.2826
21	-0.3083	71.4062	<.0001*	21	-0.0875
22	-0.3371	82.0115	<.0001*	22	-0.0220
23	-0.2303	87.2540	<.0001*	23	0.0453
24	-0.1006	88.3164	<.0001*	24	0.0451
25	-0.0342	88.4478	<.0001*	25	-0.0598

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	37	0.0019785	-130.8048	-125.7381	0.713	-136.8048	0.326116	7.144203	0.039156
☐	☐	ARMA(1, 2)	36	0.0019502	-130.2418	-123.4863	0.724	-138.2418	0.246109	7.104662	0.039156
☐	☐	ARMA(2, 1)	36	0.0020308	-128.8542	-122.0987	0.714	-136.8542	0.122972	7.156190	0.039274
☐	☐	ARMA(2, 2)	35	0.0020057	-128.2448	-119.8004	0.724	-138.2448	0.090671	7.098673	0.039127
☐	☐	ARMA(1, 1)	37	0.002136	-127.9080	-122.8413	0.701	-133.908	0.076620	7.156730	0.039849
☐	☐	ARIMA(2, 1, 1	35	0.0020092	-126.9309	-120.2767	0.766	-134.9309	0.047009	5.797549	0.033997
☐	☐	MA(2)	37	0.0021733	-126.7017	-121.6351	0.694	-132.7017	0.041919	7.509108	0.040389
☐	☐	IMA(1, 1)	37	0.002312	-123.9449	-120.6178	0.717	-127.9449	0.010563	6.649019	0.038684
☐	☐	ARI(2, 1)	36	0.002266	-123.6772	-118.6866	0.730	-129.6772	0.009239	6.520438	0.037934
☐	☐	ARI(1, 1)	37	0.0023498	-123.3220	-119.9949	0.712	-127.322	0.007736	6.711306	0.039169
☐	☐	IMA(1, 2)	36	0.0023166	-122.8284	-117.8377	0.724	-128.8284	0.006044	6.609517	0.038636
☐	☐	ARIMA(1, 1, 1	36	0.0023579	-122.2222	-117.2316	0.719	-128.2222	0.004464	6.662556	0.038826
☐	☐	ARIMA(1, 1, 2	35	0.0023309	-121.6303	-114.9760	0.730	-129.6303	0.003320	6.641226	0.038790
☐	☐	AR(1)	38	0.0025784	-121.6287	-118.2509	0.650	-125.6287	0.003317	7.355185	0.041391
☐	☐	ARIMA(2, 1, 2	34	0.0023199	-120.7921	-112.4743	0.738	-130.7921	0.002184	6.435348	0.037472
☐	☐	I(1)	38	0.0026428	-119.8360	-118.1725	0.668	-121.836	0.001354	6.977902	0.040679
☐	☐	IMA(2, 2)	35	0.002432	-114.8197	-109.9070	0.658	-120.8197	0.000110	7.097401	0.041344
☐	☐	ARIMA(2, 2, 1	34	0.0023786	-114.5176	-107.9672	0.674	-122.5176	0.000095	7.001628	0.040800
☐	☐	ARIMA(1, 2, 1	35	0.0024794	-114.3983	-109.4855	0.653	-120.3983	0.000089	7.096134	0.041518
☐	☐	ARIMA(1, 2, 2	34	0.0024882	-113.2331	-106.6827	0.661	-121.2331	0.000050	7.064101	0.041258
☐	☐	ARIMA(2, 2, 2	33	0.0025687	-110.6575	-102.4696	0.655	-120.6575	0.000014	7.064384	0.041302
☐	☐	I(2)	37	0.0034342	-106.7850	-105.1474	0.527	-108.785	0.000002	7.540066	0.044561
☐	☐	MA(1)	38	0.0037859	-106.7466	-103.3689	0.526	-110.7466	0.000002	9.334008	0.050371
☐	☐	IMA(2, 1)	36	0.0033535	-106.5814	-103.3062	0.550	-110.5814	0.000002	7.735780	0.045637
☐	☐	ARI(1, 2)	36	0.0034372	-105.7658	-102.4907	0.539	-109.7658	0.000001	7.538896	0.044503
☐	☐	ARI(2, 2)	35	0.003448	-104.6697	-99.75690	0.550	-110.6697	0.000001	7.485385	0.044180
☐	☐	ARIMA(0, 0, 0	39	0.0084856	-76.27314	-74.58426	-0.00	-78.27314	0.000000	13.619475	0.073412



Model: AR(2)

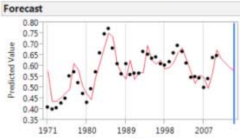
Model Summary

DF	37	Stable	Yes
Sum of Squared Errors	0.07320429	Invertible	Yes
Variance Estimate	0.00197849		
Standard Deviation	0.04448027		
Akaike's 'A' Information Criterion	-130.80479		
Schwarz's Bayesian Criterion	-125.73815		
RSquare	0.7127848		
RSquare Adj	0.69725965		
MAPE	7.14420254		
MAE	0.03915571		
-2LogLikelihood	-136.80479		

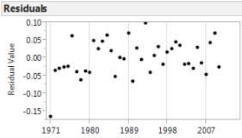
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.265739	0.1329995	9.52	<.0001*	0.14039153
AR2	2	-0.509835	0.1393959	-3.66	0.0008*	
Intercept	0	0.575149	0.0271329	21.20	<.0001*	

Forecast

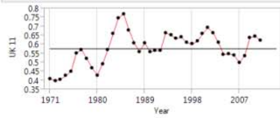


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0439	0.0830	0.7732	1	0.0439
2	0.0383	0.1479	0.9287	2	0.0364
3	-0.0695	0.3671	0.9469	3	-0.0729
4	0.0921	0.7632	0.9433	4	0.0978
5	-0.1427	1.7403	0.8838	5	-0.1490
6	0.0229	1.7662	0.9399	6	0.0288
7	0.1309	2.6388	0.9163	7	0.1569
8	0.2320	5.4656	0.7069	8	0.1935
9	0.0821	5.8305	0.7568	9	0.0912
10	-0.1306	6.7863	0.7455	10	-0.1761
11	-0.1393	7.9108	0.7213	11	-0.1528
12	0.0205	7.9361	0.7901	12	0.0563
13	-0.0897	8.4362	0.8141	13	-0.0532
14	-0.1595	10.0800	0.7563	14	-0.1646
15	0.0551	10.2837	0.8015	15	-0.0069
16	0.1167	11.2366	0.7947	16	0.0257
17	0.1358	12.5831	0.7636	17	0.1932
18	-0.1789	15.0274	0.6601	18	-0.1094
19	0.0418	15.1673	0.7119	19	0.0618
20	-0.0106	15.1767	0.7662	20	0.0378
21	-0.0993	16.0494	0.7669	21	-0.1248
22	-0.2401	21.4320	0.4942	22	-0.1465
23	-0.0269	21.5033	0.5504	23	-0.1164
24	0.0632	21.9232	0.5838	24	-0.0358
25	0.0107	21.9360	0.6394	25	-0.0313

Time Series UK 11



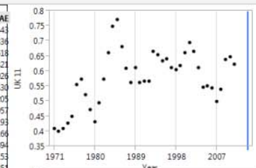
Mean	0.577702
Std	0.0901315
N	41
Zero Mean ADF	0.3140648
Single Mean ADF	-2.30582
Trend ADF	-2.208067

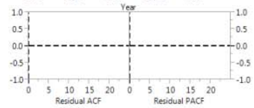
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8004	28.2379	<.0001*	1	0.8004
2	0.4784	38.5853	<.0001*	2	-0.4515
3	0.1875	40.2157	<.0001*	3	-0.0244
4	0.0244	40.2440	<.0001*	4	0.1072
5	-0.0332	40.2980	<.0001*	5	-0.0198
6	0.0465	40.4071	<.0001*	6	0.2723
7	0.1788	42.0644	<.0001*	7	0.0456
8	0.2392	45.1213	<.0001*	8	-0.1521
9	0.1532	46.4145	<.0001*	9	-0.1786
10	-0.0253	46.4509	<.0001*	10	-0.1160
11	-0.1732	48.2148	<.0001*	11	0.0907
12	-0.2403	51.7242	<.0001*	12	0.0055
13	-0.2464	55.5456	<.0001*	13	-0.1272
14	-0.1649	57.3220	<.0001*	14	0.0998
15	-0.0046	57.3235	<.0001*	15	0.1384
16	0.1150	58.2568	<.0001*	16	-0.0662
17	0.1190	59.2973	<.0001*	17	-0.0246
18	0.0041	59.2986	<.0001*	18	-0.1768
19	-0.1059	60.1970	<.0001*	19	0.0941
20	-0.2180	64.1869	<.0001*	20	-0.1832
21	-0.3087	72.5890	<.0001*	21	-0.1695
22	-0.3304	82.7175	<.0001*	22	0.0210
23	-0.2308	87.9338	<.0001*	23	0.0432
24	-0.0949	88.8670	<.0001*	24	0.0317
25	-0.0186	88.9052	<.0001*	25	-0.0179

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	38	0.0019295	-135.2213	-130.0806	0.715	-141.2213	0.320326	7.006131	0.038443
☐	☐	ARMA(1, 2)	37	0.0019003	-134.7185	-127.8643	0.725	-142.7185	0.249129	6.951871	0.038336
☐	☐	ARMA(2, 1)	37	0.0019777	-133.2991	-126.4448	0.716	-141.2991	0.122515	7.010875	0.038518
☐	☐	ARMA(2, 2)	36	0.0019529	-132.7198	-124.1520	0.725	-142.7198	0.091709	6.948676	0.038321
☐	☐	ARMA(1, 1)	38	0.0020799	-132.3065	-127.1658	0.703	-138.3065	0.074587	6.989035	0.038926
☐	☐	ARIMA(2, 1, 1	36	0.0019601	-131.3045	-124.5490	0.766	-139.3045	0.045195	5.696328	0.033430
☐	☐	MA(2)	38	0.0021493	-130.5349	-125.3942	0.692	-136.5349	0.030759	7.463763	0.040205
☐	☐	ARIMA(2, 1, 2	35	0.0019758	-130.0160	-121.5716	0.771	-140.016	0.023730	5.622922	0.032957
☐	☐	IMA(1, 1)	38	0.0022613	-128.0563	-124.6786	0.717	-132.0563	0.008907	6.558126	0.038193
☐	☐	ARI(2, 1)	37	0.0022055	-127.9993	-122.9327	0.731	-133.9993	0.008657	6.385357	0.037166
☐	☐	ARI(1, 1)	38	0.0023123	-127.1812	-123.8034	0.711	-131.1812	0.005750	6.654712	0.038894
☐	☐	IMA(1, 2)	37	0.0022648	-126.9412	-121.8745	0.724	-132.9412	0.005100	6.519947	0.038153
☐	☐	ARIMA(1, 1, 1	37	0.0023063	-126.3102	-121.2436	0.719	-132.3102	0.003720	6.574878	0.038351
☐	☐	ARIMA(1, 1, 2	36	0.0022704	-125.8798	-119.1243	0.731	-133.8798	0.003000	6.531435	0.038177
☐	☐	ARIMA(2, 2, 2	34	0.0016324	-125.7602	-117.4424	0.739	-135.7602	0.002826	5.896997	0.034262
☐	☐	AR(1)	39	0.0025168	-125.7545	-122.3273	0.653	-129.7545	0.002818	7.213825	0.040645
☐	☐	I(1)	39	0.0025975	-123.6261	-121.9372	0.667	-125.6261	0.000972	6.914203	0.040373
☐	☐	IMA(2, 2)	36	0.0023695	-118.9897	-113.9990	0.659	-124.9897	0.000096	6.962037	0.040584
☐	☐	ARIMA(2, 2, 1	35	0.0023105	-118.8199	-112.1656	0.675	-126.8199	0.000088	6.822784	0.039757
☐	☐	ARIMA(1, 2, 1	36	0.0024281	-118.3388	-113.3481	0.653	-124.3388	0.000069	7.006779	0.041043
☐	☐	ARIMA(1, 2, 2	35	0.0024238	-117.3735	-110.7192	0.662	-125.3735	0.000043	6.939524	0.040558
☐	☐	I(2)	38	0.0033717	-110.3373	-108.6737	0.525	-112.3373	0.000001	7.507621	0.044372
☐	☐	MA(1)	39	0.0037108	-110.3095	-106.8823	0.526	-114.3095	0.000001	9.217473	0.049746
☐	☐	IMA(2, 1)	37	0.0033465	-109.5769	-106.2497	0.541	-113.5769	0.000001	7.711942	0.045570
☐	☐	ARI(1, 2)	37	0.0034023	-109.0081	-105.6810	0.533	-113.0081	0.000001	7.541632	0.044553
☐	☐	ARI(2, 2)	36	0.0033934	-108.1178	-103.1271	0.547	-114.1178	0.000000	7.433494	0.043904
☐	☐	ARIMA(0, 0, 0	40	0.0083268	-78.97890	-77.26533	0.000	-80.9789	0.000000	13.501747	0.072790





Model: AR(2)

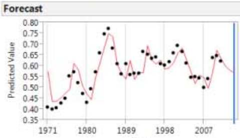
Model Summary

DF	38	Stable	Yes
Sum of Squared Errors	0.07332288	Invertible	Yes
Variance Estimate	0.00192955		
Standard Deviation	0.04392664		
Akaike's 'A' Information Criterion	-135.22127		
Schwarz's Bayesian Criterion	-130.08056		
RSquare	0.7151119		
RSquare Adj	0.70011779		
MAPE	7.0061307		
MAE	0.038443		
-2LogLikelihood	-141.22127		

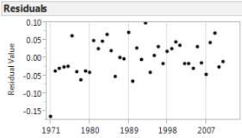
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.264500	0.1313138	9.63	<.0001*	0.14143223
AR2	2	-0.510813	0.1379029	-3.70	0.0007*	
Intercept	0	0.574197	0.0263367	21.80	<.0001*	

Forecast

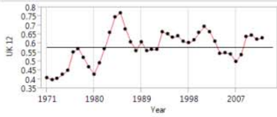


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0479	0.1013	0.7502	1	0.0479
2	0.0338	0.1530	0.9264	2	0.0316
3	-0.0714	0.3893	0.9424	3	-0.0747
4	0.0994	0.8598	0.9303	4	0.1062
5	-0.1385	1.7996	0.8761	5	-0.1473
6	0.0209	1.8216	0.9354	6	0.0279
7	0.1339	2.7519	0.9070	7	0.1605
8	0.2338	5.6719	0.6839	8	0.1919
9	0.0840	6.0608	0.7338	9	0.0940
10	-0.1328	7.0645	0.7193	10	-0.1753
11	-0.1429	8.2651	0.6894	11	-0.1566
12	0.0188	8.2865	0.7624	12	0.0517
13	-0.0907	8.8044	0.7876	13	-0.0614
14	-0.1577	10.4280	0.7303	14	-0.1604
15	0.0509	10.6037	0.7801	15	-0.0067
16	0.1151	11.5374	0.7752	16	0.0184
17	0.1393	12.9630	0.7387	17	0.1975
18	-0.1888	15.6954	0.6138	18	-0.1179
19	0.0412	15.8312	0.6685	19	0.0737
20	-0.0136	15.8468	0.7261	20	0.0379
21	-0.0930	16.6099	0.7345	21	-0.1268
22	-0.2468	22.2635	0.4443	22	-0.1488
23	-0.0278	22.3393	0.4999	23	-0.1226
24	0.0619	22.7371	0.5354	24	-0.0396
25	0.0149	22.7616	0.5915	25	-0.0278

Time Series UK 12



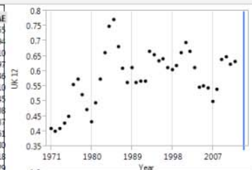
Mean	0.5789661
Std	0.0894191
N	42
Zero Mean ADF	0.3381981
Single Mean ADF	-2.323382
Trend ADF	-2.246748

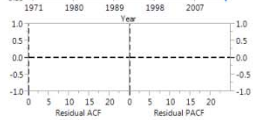
Time Series Basic Diagnostics

Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.8004	28.8784	<.0001*	1	0.8004
2	0.4844	39.7168	<.0001*	2	-0.4352
3	0.1940	41.5005	<.0001*	3	-0.0483
4	0.0162	41.5133	<.0001*	4	0.0688
5	-0.0478	41.6273	<.0001*	5	0.0289
6	0.0377	41.7004	<.0001*	6	0.2740
7	0.1698	43.2224	<.0001*	7	0.0098
8	0.2288	46.0677	<.0001*	8	-0.1323
9	0.1534	47.3862	<.0001*	9	-0.1674
10	-0.0155	47.4002	<.0001*	10	-0.1338
11	-0.1577	48.8818	<.0001*	11	0.1266
12	-0.2292	52.1182	<.0001*	12	-0.0059
13	-0.2412	55.8254	<.0001*	13	-0.1293
14	-0.1620	57.5581	<.0001*	14	0.0919
15	-0.0011	57.5581	<.0001*	15	0.1415
16	0.1229	58.6317	<.0001*	16	-0.0145
17	0.1260	59.8061	<.0001*	17	-0.0963
18	0.0152	59.8240	<.0001*	18	-0.1796
19	-0.0913	60.4942	<.0001*	19	0.1325
20	-0.2181	64.4881	<.0001*	20	-0.2217
21	-0.3082	72.8461	<.0001*	21	-0.0698
22	-0.3306	82.9445	<.0001*	22	-0.0858
23	-0.2236	87.8092	<.0001*	23	0.1064
24	-0.0962	88.7592	<.0001*	24	0.0203
25	-0.0128	88.7769	<.0001*	25	-0.0037

Model Comparison

Report	Graph	Model	DF	Variance	AIC	SBC	RSquare	-2LogLH	Weights	MAPE	MAE
☑	☐	AR(2)	39	0.0019053	-139.1699	-133.9569	0.712	-145.1699	0.336956	6.977688	0.038355
☐	☐	ARMA(1, 2)	38	0.0018913	-138.3644	-131.4138	0.719	-146.3644	0.225257	6.959809	0.038394
☐	☐	ARMA(2, 1)	38	0.0019513	-137.2523	-130.3016	0.713	-145.2523	0.129175	6.978939	0.038410
☐	☐	ARMA(1, 1)	39	0.0020373	-136.4958	-131.2828	0.702	-142.4958	0.088492	6.925821	0.038597
☐	☐	ARMA(2, 2)	37	0.0019385	-136.4334	-127.7451	0.719	-146.4334	0.085776	6.930796	0.038246
☐	☐	ARIMA(2, 1, 1	37	0.0019233	-135.4590	-128.6047	0.766	-143.459	0.052694	5.670065	0.033310
☐	☐	MA(2)	39	0.0021194	-134.3908	-129.1778	0.689	-140.3908	0.030890	7.435436	0.040045
☐	☐	IMA(1, 1)	39	0.0022057	-132.3294	-128.9023	0.719	-136.3294	0.011020	6.437814	0.037508
☐	☐	ARI(2, 1)	38	0.0021547	-132.2373	-127.0966	0.733	-138.2373	0.010524	6.290866	0.036637
☐	☐	ARI(1, 1)	39	0.0022573	-131.4010	-127.9738	0.712	-135.401	0.006927	6.543489	0.038261
☐	☐	IMA(1, 2)	38	0.0022175	-131.0792	-125.9385	0.725	-137.0792	0.005898	6.455227	0.037780
☐	☐	ARIMA(1, 1, 1	38	0.0022497	-130.5625	-125.4218	0.721	-136.5625	0.004555	6.463636	0.037718
☐	☐	ARIMA(1, 1, 2	37	0.0022195	-130.0663	-123.2120	0.731	-138.0663	0.003554	6.452535	0.037729
☐	☐	AR(1)	40	0.0024592	-129.8566	-126.3813	0.653	-133.8566	0.003201	7.113210	0.040093
☐	☐	ARIMA(2, 1, 2	36	0.002207	-129.2734	-120.7056	0.740	-139.2734	0.002391	6.273950	0.036532
☐	☐	ARIMA(2, 2, 2	35	0.0016372	-127.9080	-119.4636	0.726	-137.908	0.001208	6.055592	0.035229
☐	☐	I(1)	40	0.0025327	-127.7773	-126.0638	0.669	-129.7773	0.001132	6.754174	0.039442
☐	☐	IMA(2, 2)	37	0.0023124	-123.1461	-118.0795	0.660	-129.1461	0.000112	6.860733	0.040018
☐	☐	ARIMA(2, 2, 1	36	0.0022616	-122.8796	-116.1240	0.675	-130.8796	0.000098	6.751216	0.039367
☐	☐	ARIMA(1, 2, 1	37	0.0023715	-122.4291	-117.3624	0.654	-128.4291	0.000078	6.918001	0.040544
☐	☐	ARIMA(1, 2, 2	36	0.0023654	-121.4928	-114.7373	0.663	-129.4928	0.000049	6.851442	0.040063
☐	☐	IMA(2, 1)	38	0.0026378	-118.3354	-114.9577	0.599	-122.3354	0.000010	7.145842	0.041522
☐	☐	I(2)	39	0.0033103	-113.9262	-112.2373	0.525	-115.9262	0.000001	7.419204	0.043936
☐	☐	MA(1)	40	0.0036432	-113.8295	-110.3541	0.526	-117.8295	0.000001	9.122013	0.049249
☐	☐	ARI(1, 2)	38	0.0033318	-112.6878	-109.3100	0.534	-116.6878	0.000001	7.445032	0.044046
☐	☐	ARI(2, 2)	37	0.003304	-112.0246	-106.9580	0.550	-118.0246	0.000000	7.292198	0.043079
☐	☐	ARIMA(0, 0, 0	41	0.0081908	-81.62052	-79.88285	0.000	-83.62052	0.000000	13.409958	0.072321





Model: AR(2)

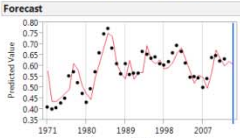
Model Summary

DF	39	Stable	Yes
Sum of Squared Errors	0.07430812	Invertible	Yes
Variance Estimate	0.00190534		
Standard Deviation	0.04365016		
Akaike's 'A' Information Criterion	-139.16987		
Schwarz's Bayesian Criterion	-133.95686		
RSquare	0.71238943		
RSquare Adj	0.69764017		
MAPE	6.97768835		
MAE	0.03835458		
-2LogLikelihood	-145.16987		

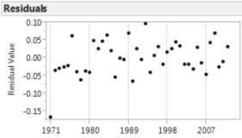
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
AR1	1	1.261120	0.1306732	9.65	<.0001*	0.13840661
AR2	2	-0.501038	0.1367674	-3.66	0.0007*	
Intercept	0	0.576892	0.0265160	21.76	<.0001*	

Forecast



Residuals

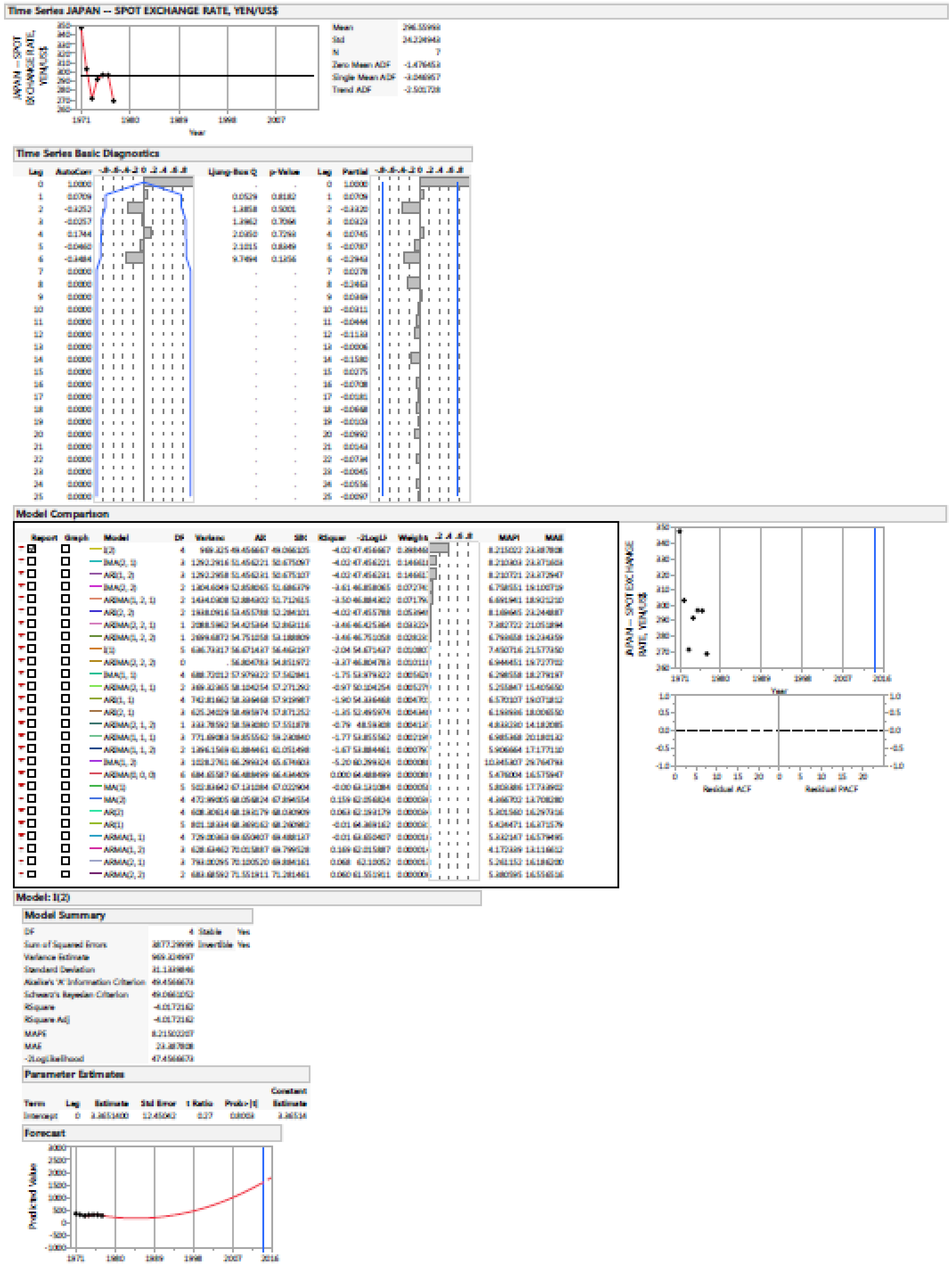


Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0444	0.0890	0.7655	1	0.0444
2	0.0172	0.1027	0.9500	2	0.0153
3	-0.0563	0.2526	0.9687	3	-0.0578
4	0.1016	0.7544	0.9445	4	0.1069
5	-0.1618	2.0616	0.8406	5	-0.1726
6	0.0109	2.0676	0.9134	6	0.0250
7	0.1425	3.1405	0.8717	7	0.1641
8	0.2218	5.8136	0.6681	8	0.1822
9	0.0782	6.1563	0.7242	9	0.0987
10	-0.1403	7.2938	0.6974	10	-0.1888
11	-0.1336	8.3578	0.6809	11	-0.1570
12	0.0277	8.4049	0.7527	12	0.0690
13	-0.0852	8.8679	0.7828	13	-0.0436
14	-0.1507	10.3664	0.7349	14	-0.1391
15	0.0476	10.5217	0.7857	15	-0.0289
16	0.1282	11.6891	0.7651	16	0.0237
17	0.1431	13.2037	0.7224	17	0.2261
18	-0.1982	16.2292	0.5766	18	-0.1363
19	0.0752	16.6835	0.6113	19	0.0963
20	-0.0152	16.7030	0.6722	20	0.0012
21	-0.0829	17.3070	0.6923	21	-0.1144
22	-0.2679	23.9381	0.3505	22	-0.1513
23	-0.0019	23.9384	0.4072	23	-0.1179
24	0.0638	24.3567	0.4414	24	-0.0147
25	0.0192	24.3966	0.4966	25	-0.0125

FY79-FY12

Japan

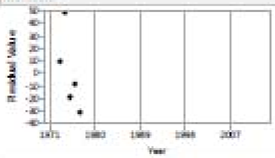
Japan - Time Series of JAPAN -- SPOT EXCHANGE RATE, YEN/US$



Time Series JAPAN -- SPOT EXCHANGE RATE, YEN/US$

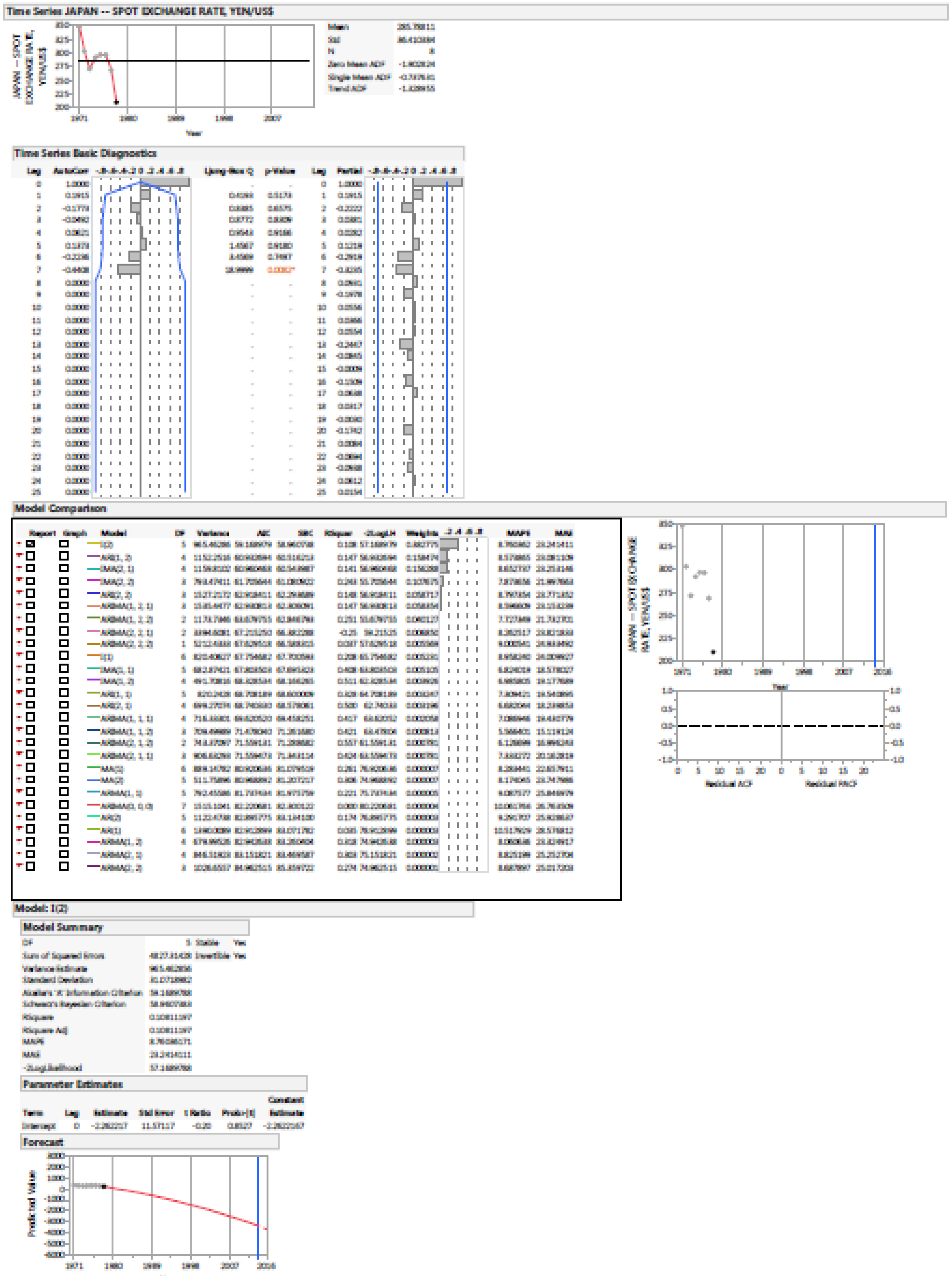
Model: I(2)

Residuals

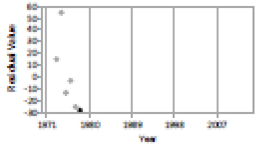


Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	-0.0089	0.0007	0.9790	1	-0.0089
2	-0.0065	0.0009	0.9995	2	-0.0046
3	-0.4112	2.9595	0.3979	3	-0.4112
4	-0.0754	3.1588	0.5316	4	-0.1006
5	0.0000	.	.	5	-0.0127
6	0.0000	.	.	6	-0.2084
7	0.0000	.	.	7	-0.1048
8	0.0000	.	.	8	-0.0321
9	0.0000	.	.	9	-0.1150
10	0.0000	.	.	10	-0.0859
11	0.0000	.	.	11	-0.0431
12	0.0000	.	.	12	-0.0782
13	0.0000	.	.	13	-0.0723
14	0.0000	.	.	14	-0.0462
15	0.0000	.	.	15	-0.0586
16	0.0000	.	.	16	-0.0586
17	0.0000	.	.	17	-0.0448
18	0.0000	.	.	18	-0.0477
19	0.0000	.	.	19	-0.0487
20	0.0000	.	.	20	-0.0416
21	0.0000	.	.	21	-0.0412
22	0.0000	.	.	22	-0.0416
23	0.0000	.	.	23	-0.0379
24	0.0000	.	.	24	-0.0368
25	0.0000	.	.	25	-0.0365

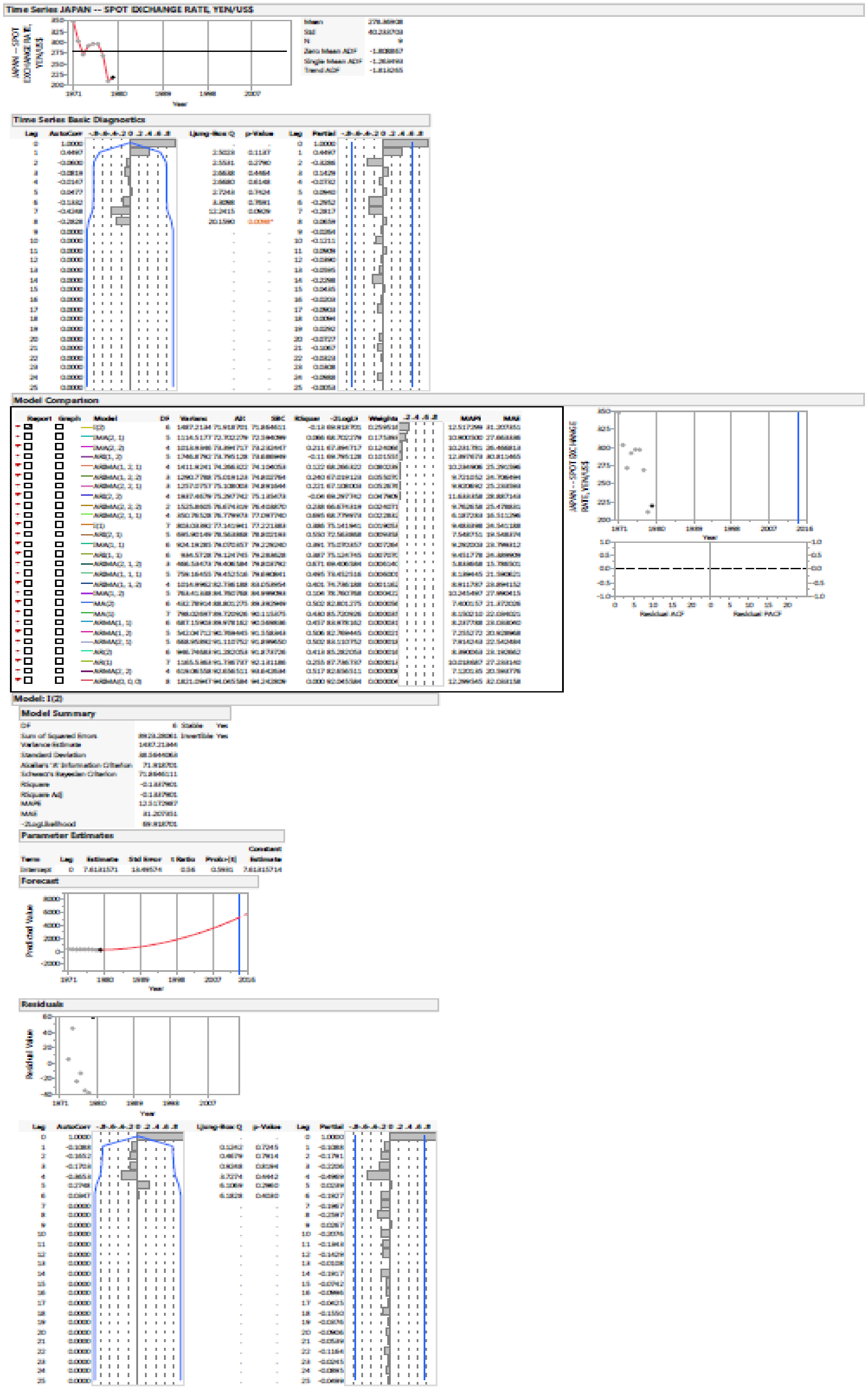
Japan - Time Series of JAPAN -- SPOT EXCHANGE RATE, YEN/US$ 2

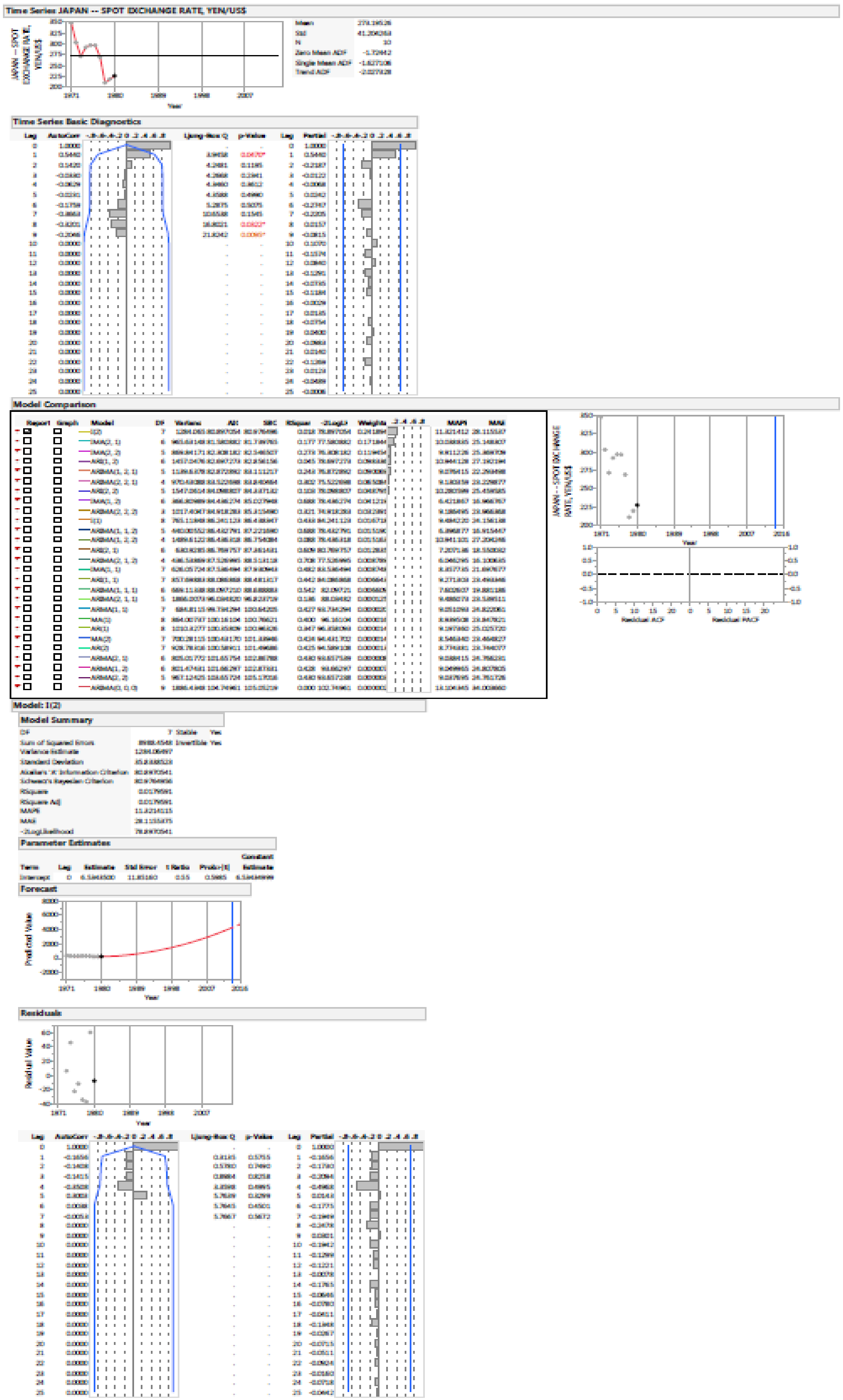


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.1912	0.8508	0.5516	1	0.1912
2	0.0115	0.8524	0.6884	2	-0.0260
3	-0.2178	1.1079	0.7752	3	-0.2229
4	-0.4978	4.8970	0.2980	4	-0.4427
5	-0.0880	5.2690	0.3839	5	0.0968
6	0.0000	.	.	6	-0.0181
7	0.0000	.	.	7	-0.1666
8	0.0000	.	.	8	-0.1618
9	0.0000	.	.	9	-0.0011
10	0.0000	.	.	10	-0.0342
11	0.0000	.	.	11	-0.1181
12	0.0000	.	.	12	-0.0904
13	0.0000	.	.	13	-0.0165
14	0.0000	.	.	14	-0.0421
15	0.0000	.	.	15	-0.0686
16	0.0000	.	.	16	-0.0583
17	0.0000	.	.	17	-0.0241
18	0.0000	.	.	18	-0.0424
19	0.0000	.	.	19	-0.0608
20	0.0000	.	.	20	-0.0427
21	0.0000	.	.	21	-0.0274
22	0.0000	.	.	22	-0.0392
23	0.0000	.	.	23	-0.0468
24	0.0000	.	.	24	-0.0345
25	0.0000	.	.	25	-0.0281


Time Series JAPAN -- SPOT EXCHANGE RATE, YEN/US$
Time Series Basic Diagnostics
Model Comparison
Model: I(2)
Model Summary
Parameter Estimates
Forecast
Residuals


Time Series JAPAN -- SPOT EXCHANGE RATE, YEN/US$
Year
Time Series Basic Diagnostics
Lag
AutoCorr
Ljung-Box Q
p-Value
Partial
Model Comparison
Report
Graph
Model
DF
Variance
AIC
SBC
RSquare
-2LogLH
Weights
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MAE
Residual ACF
Residual PACF
Model: I(2)
Model Summary
Parameter Estimates
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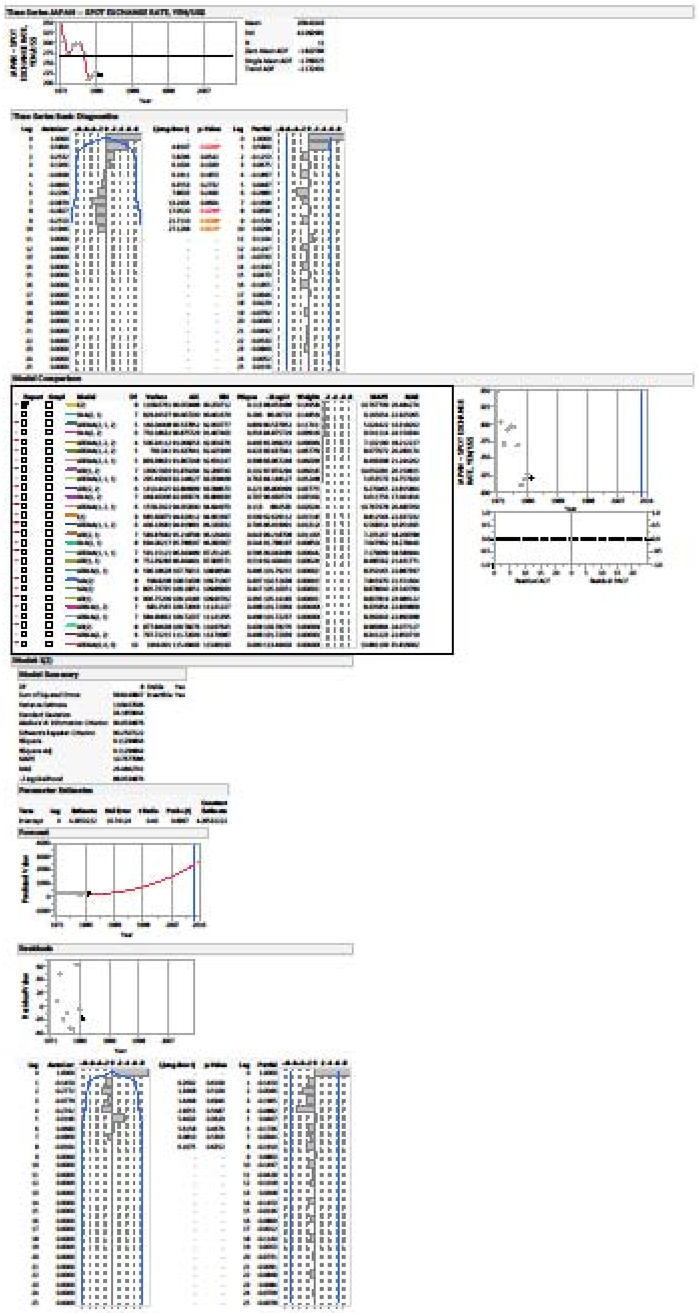
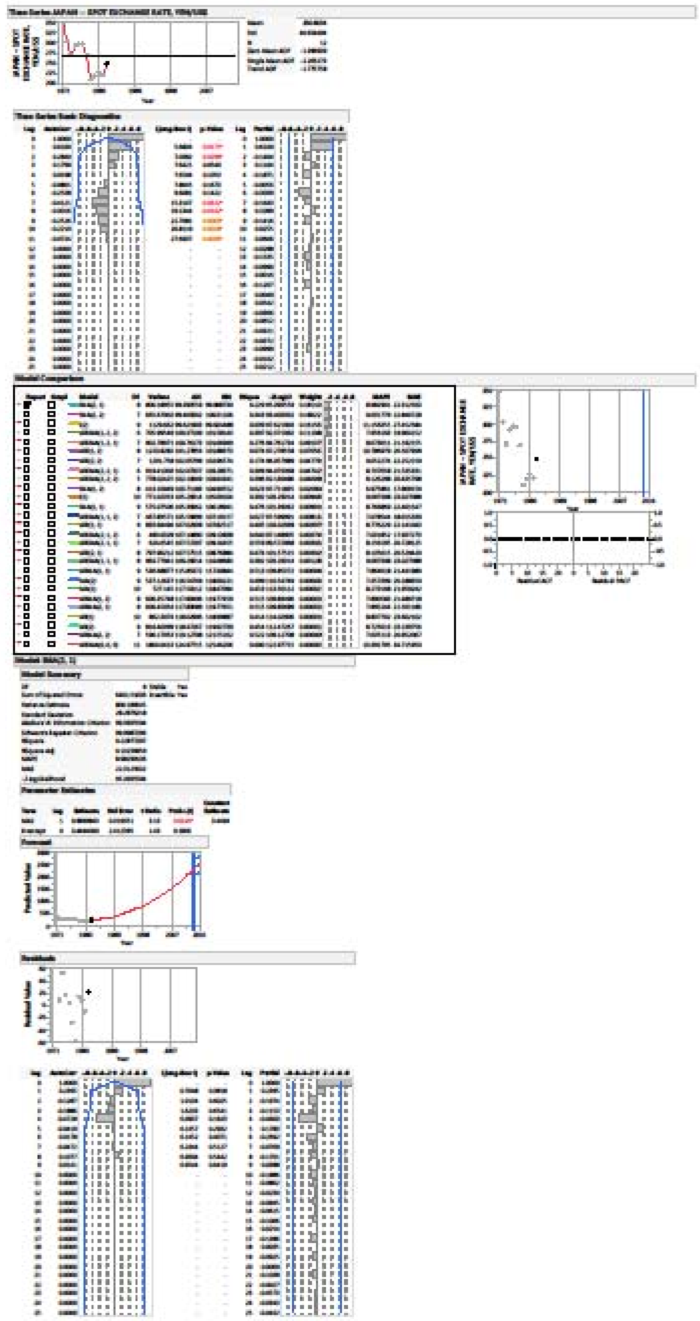
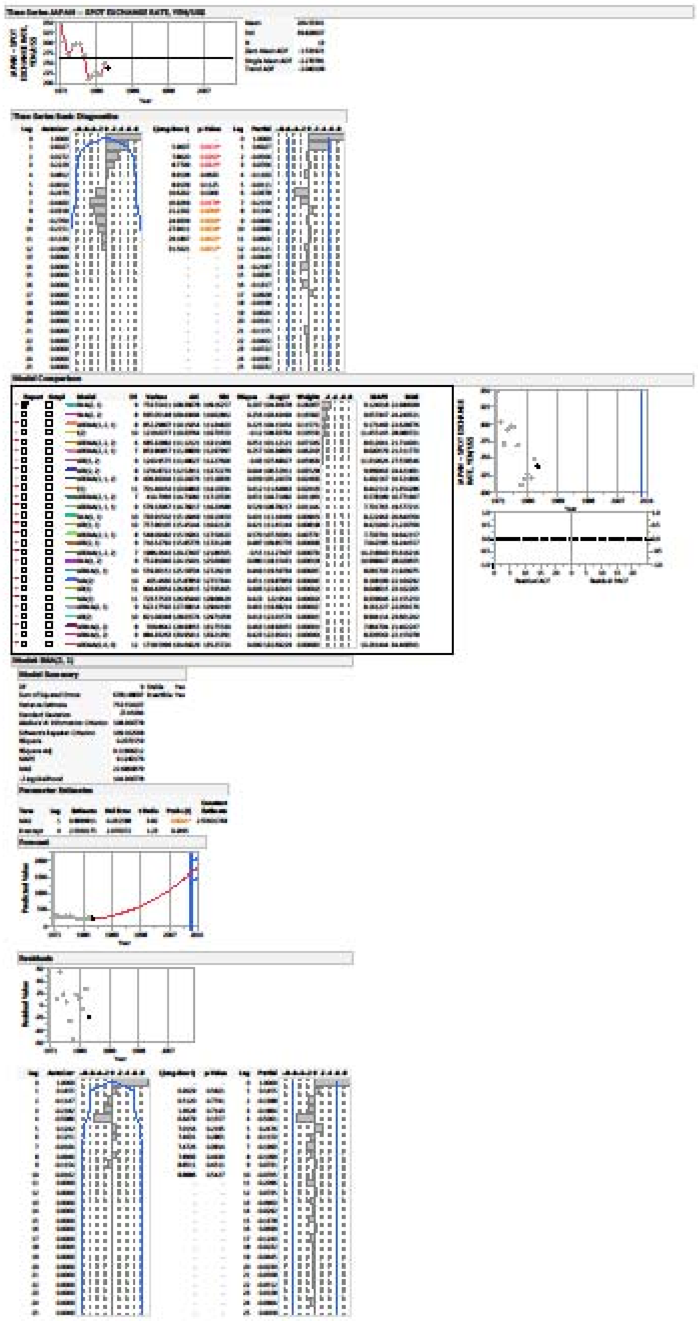
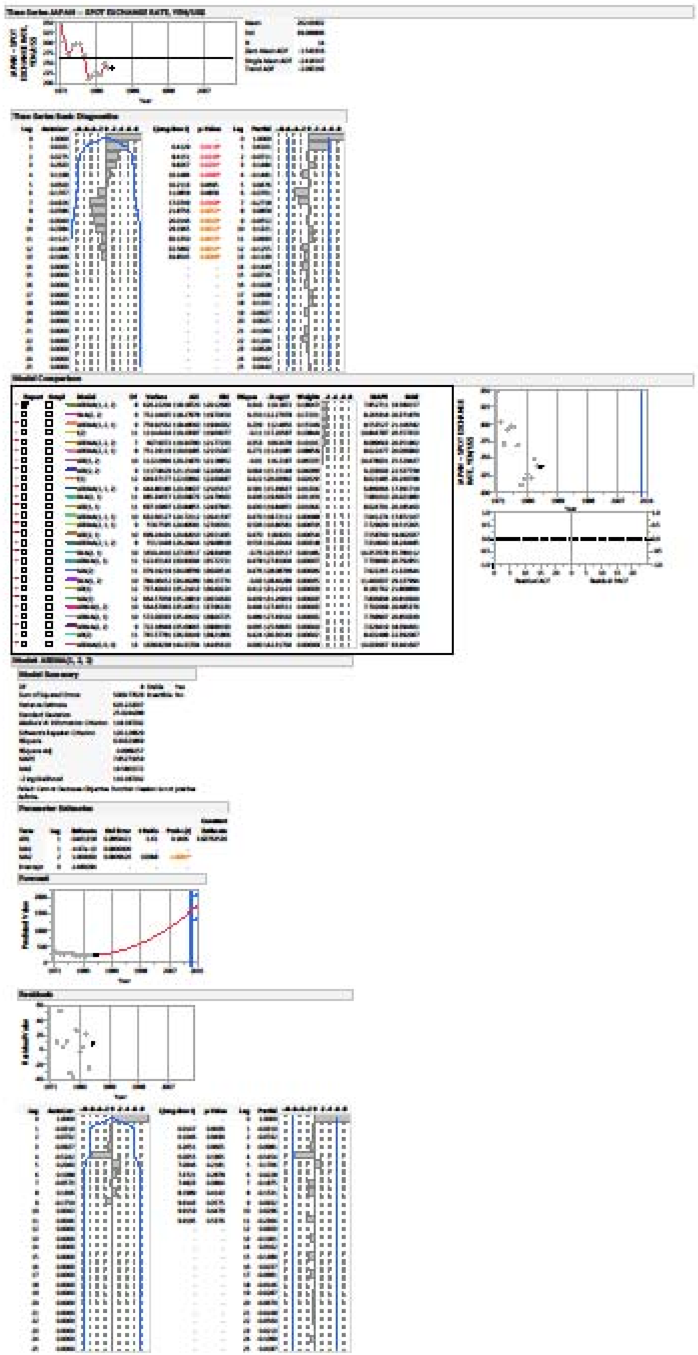
Predicted Value
Residuals
Residual Value

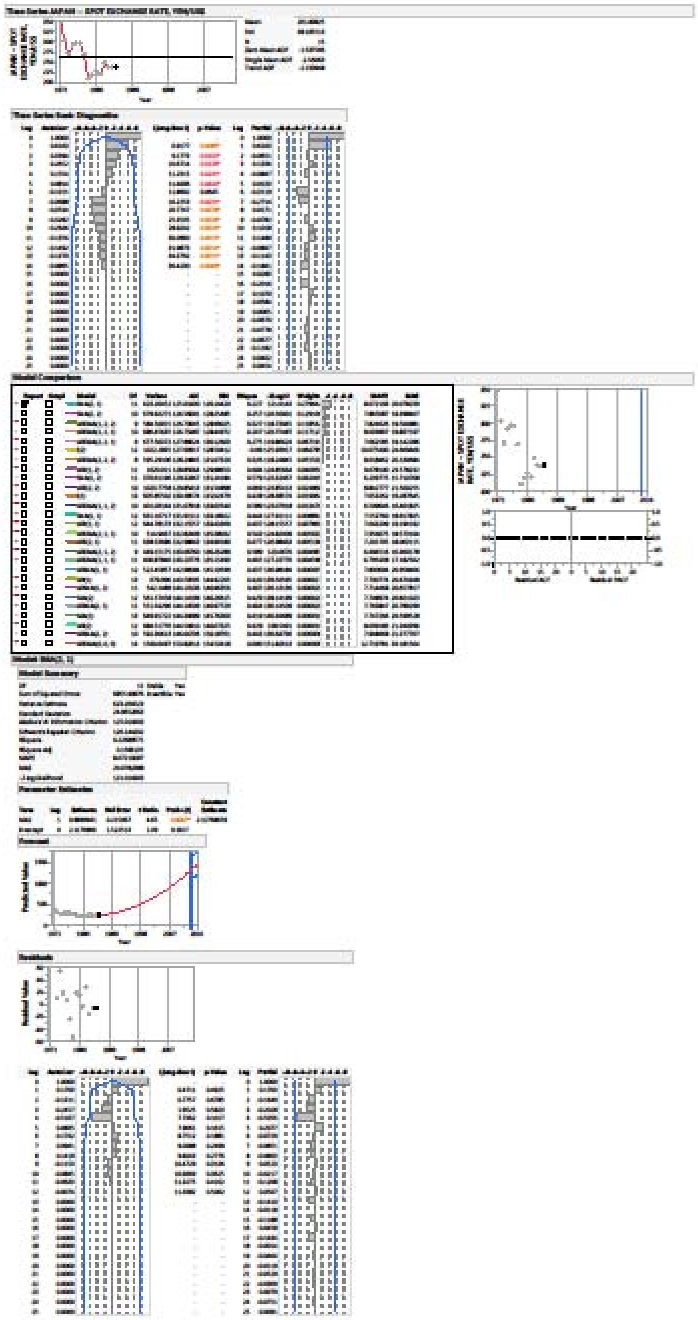


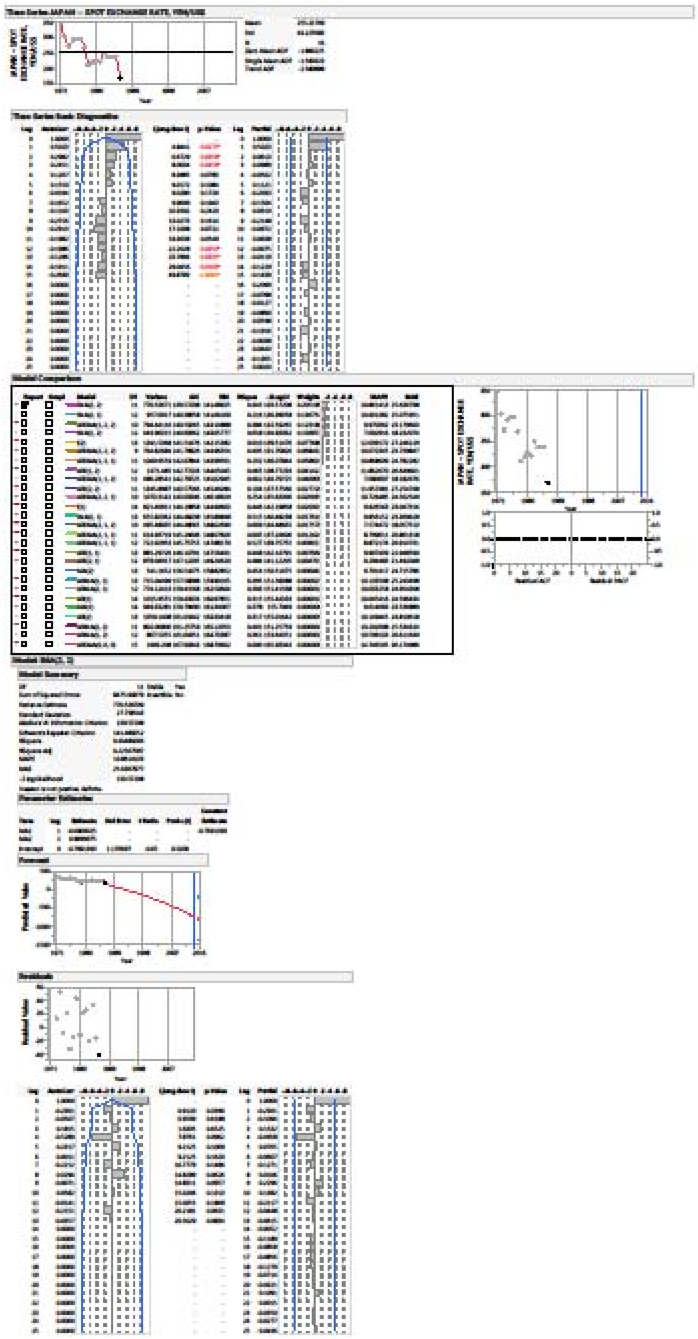


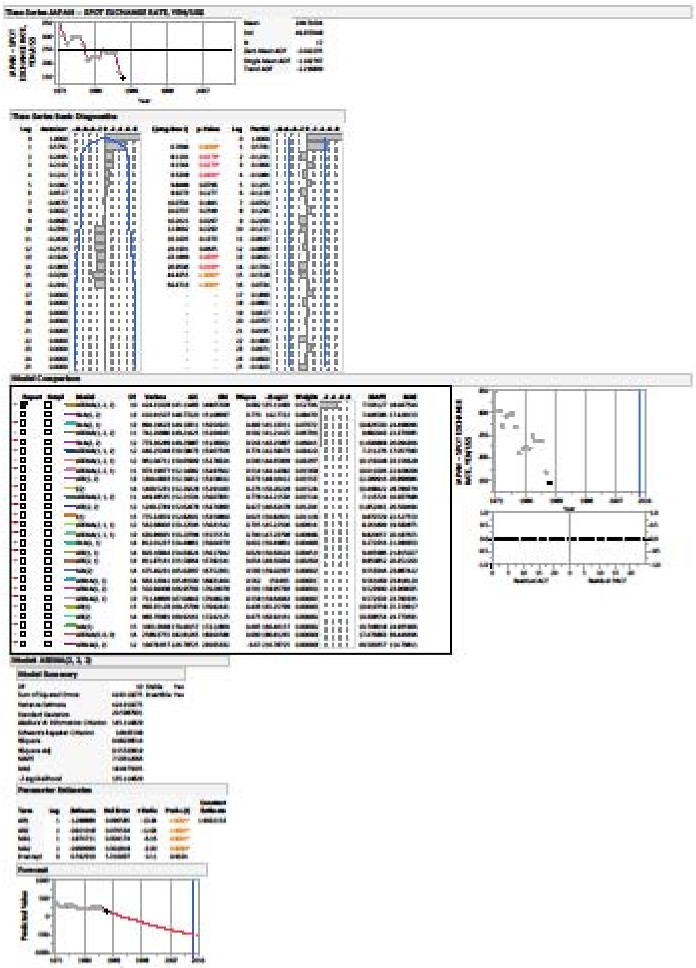


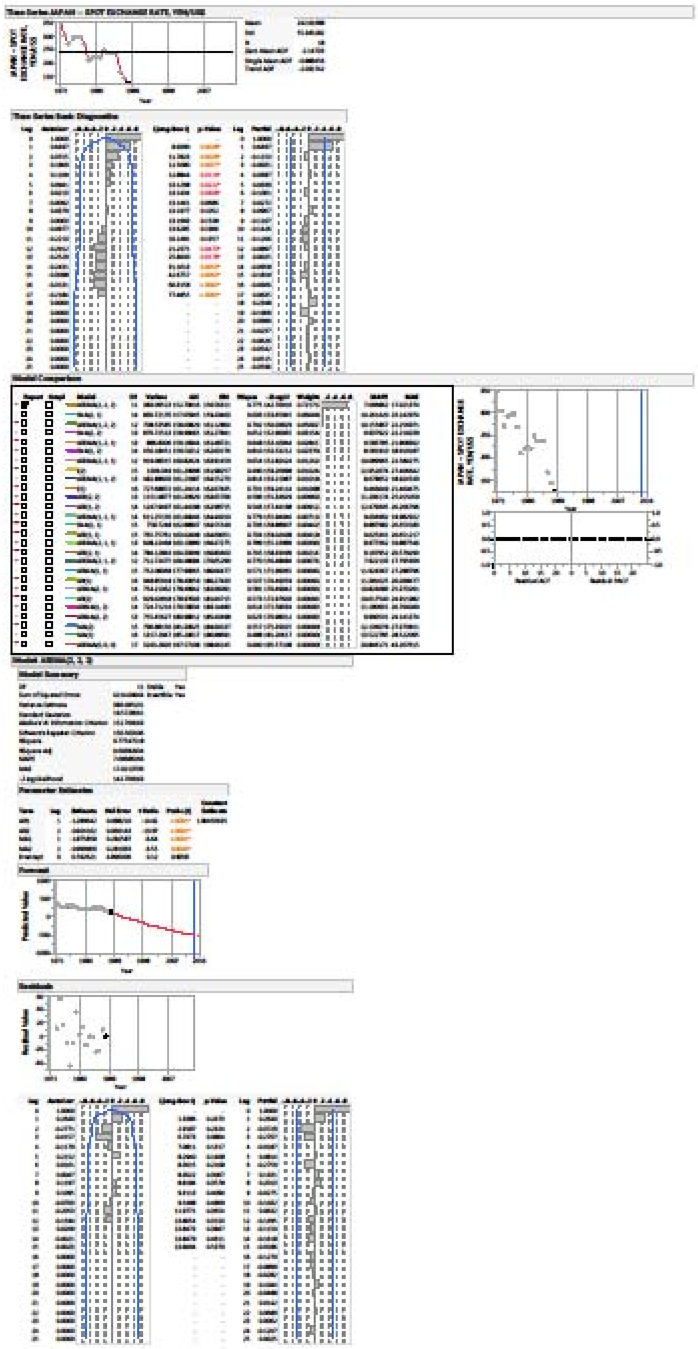


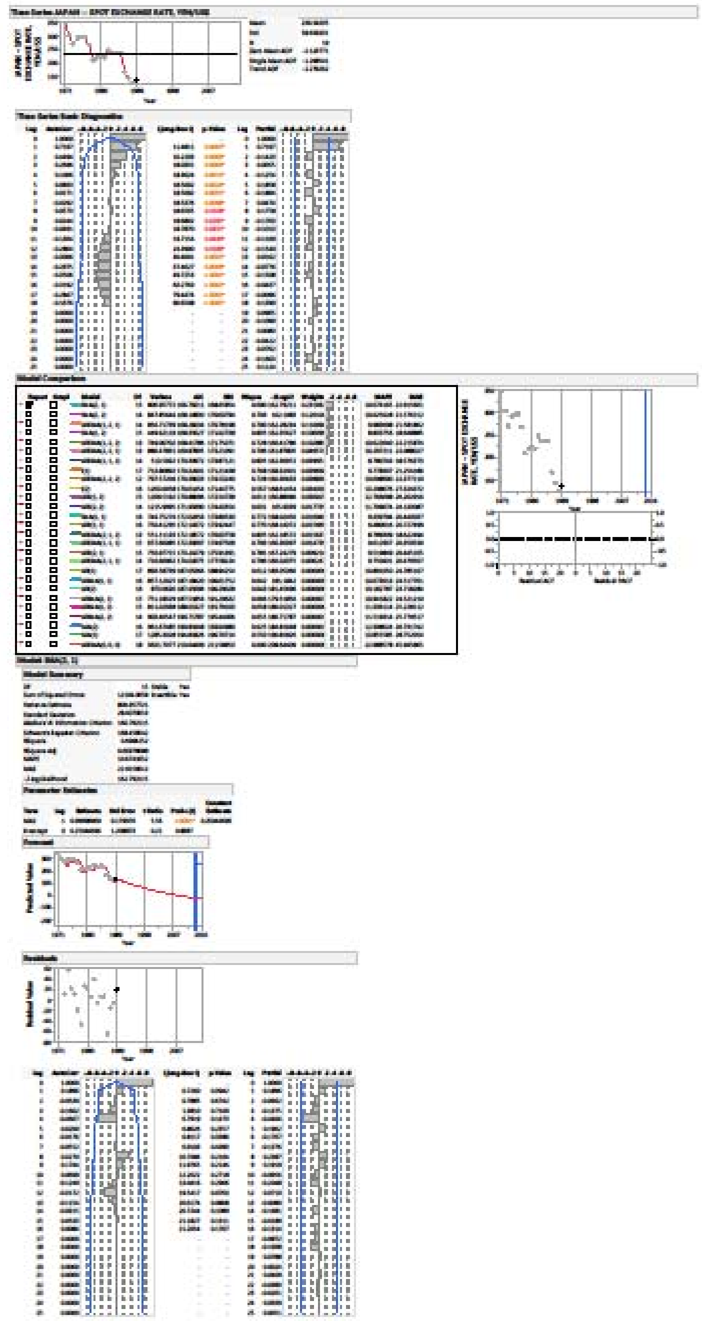
Japan - Time Series of JAPAN -- SPOT EXCHANGE RATE, YEN/US$

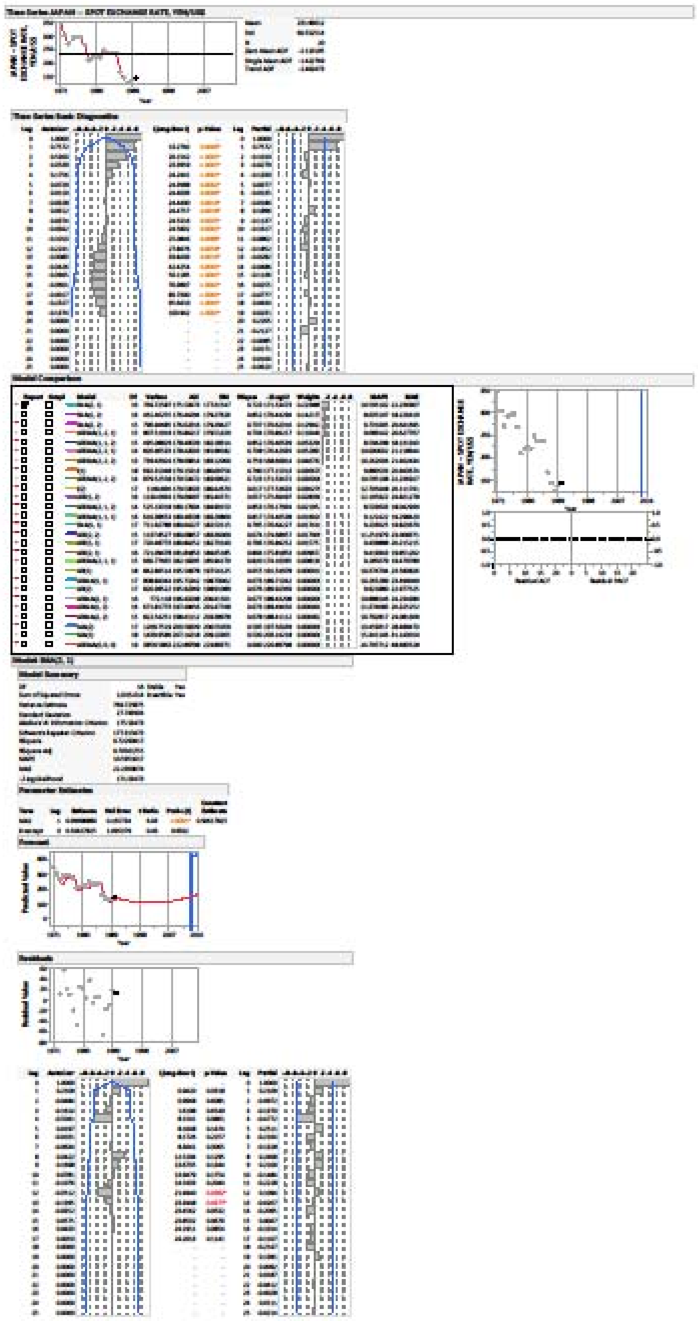


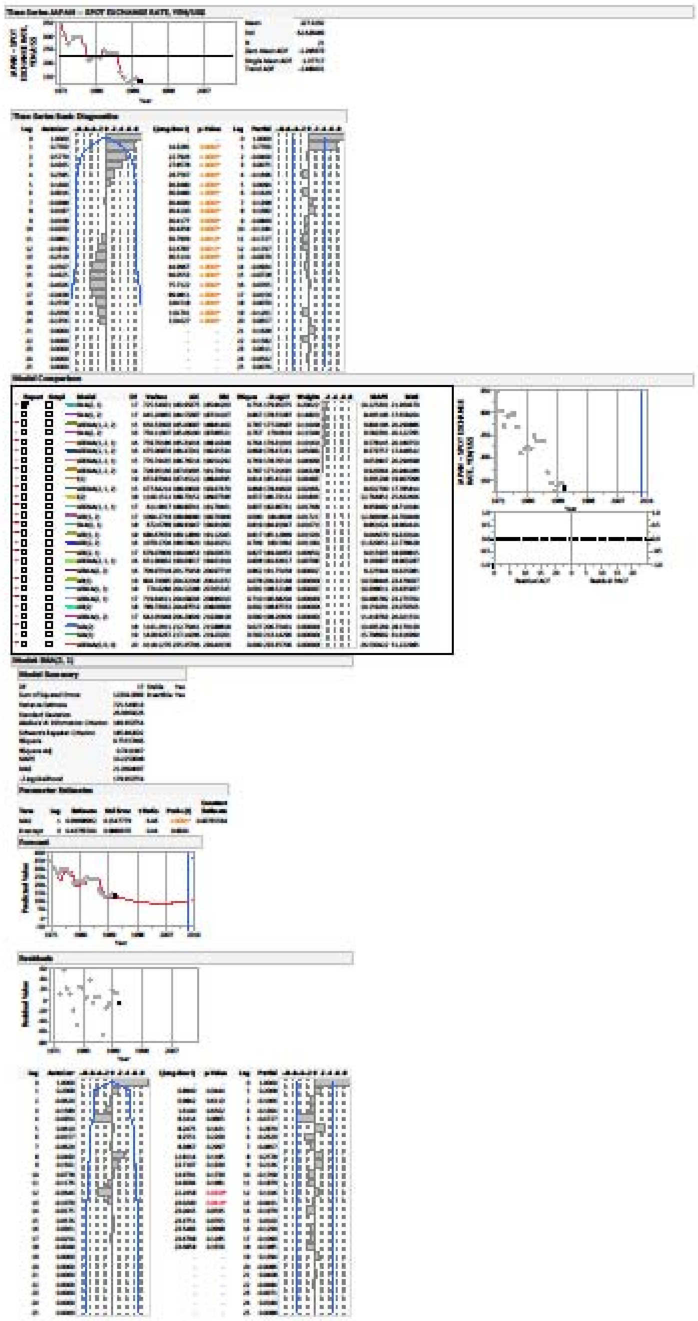


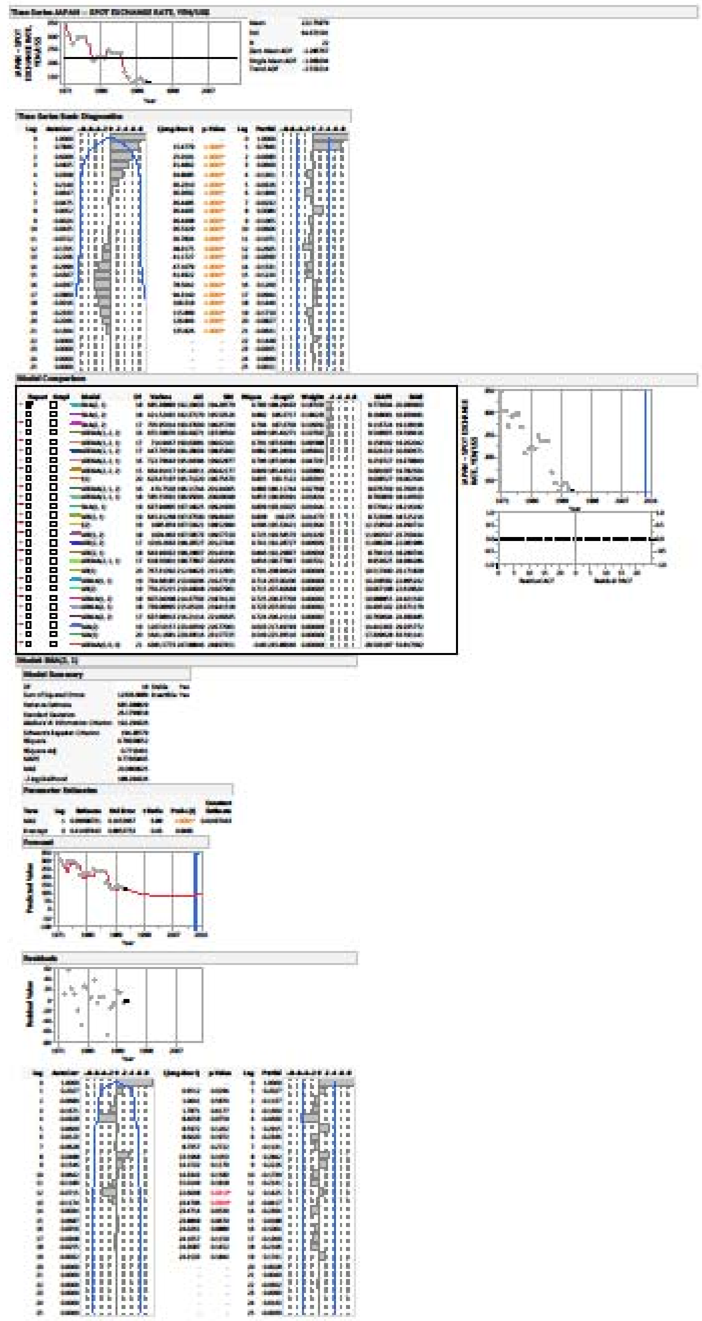


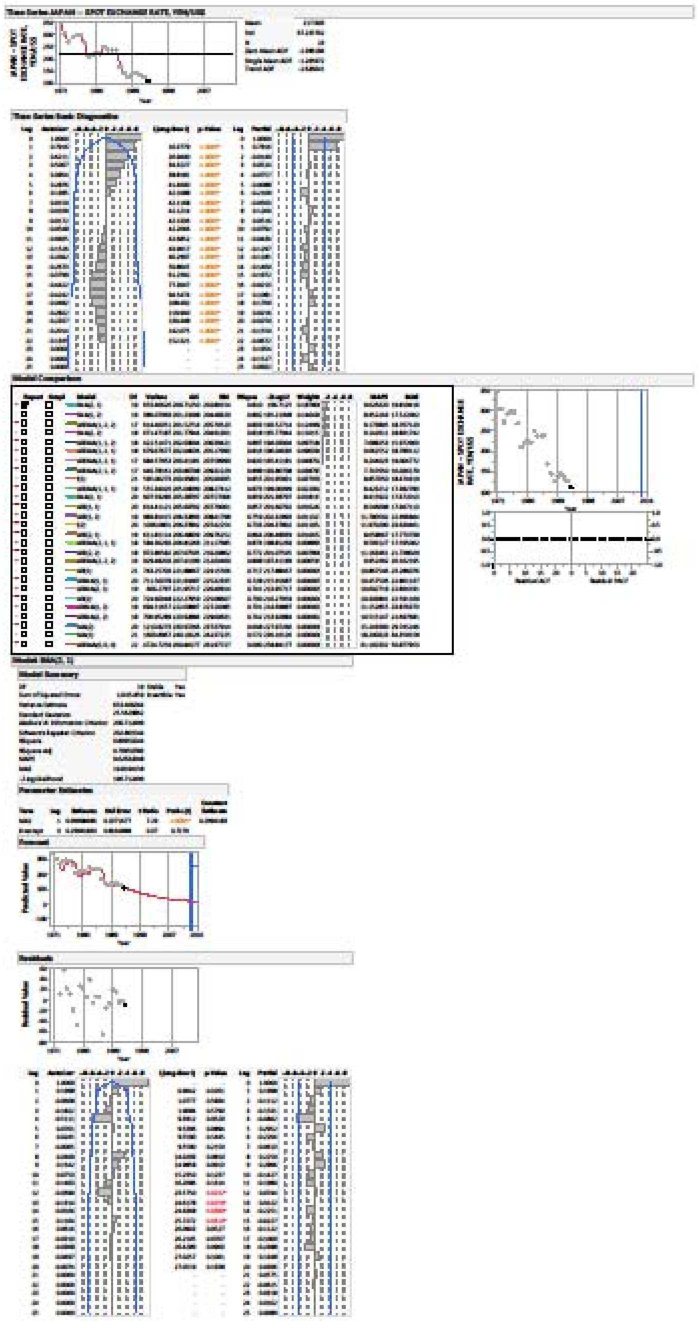


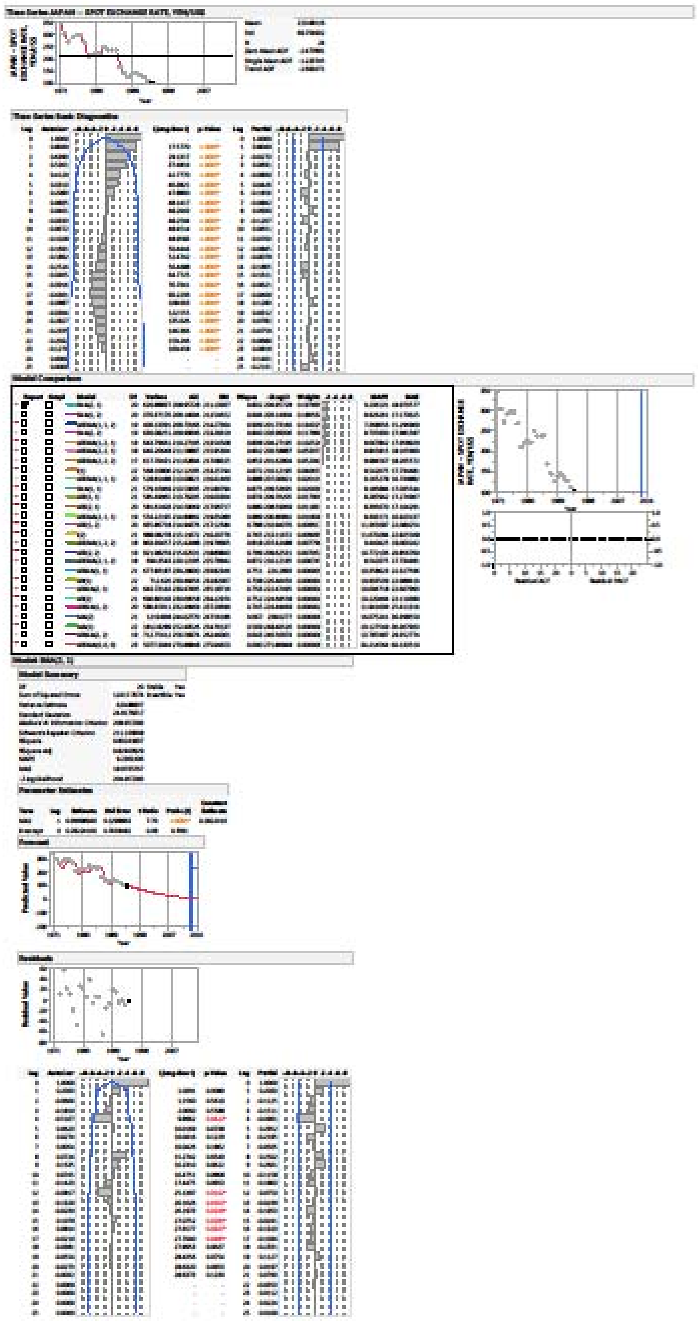


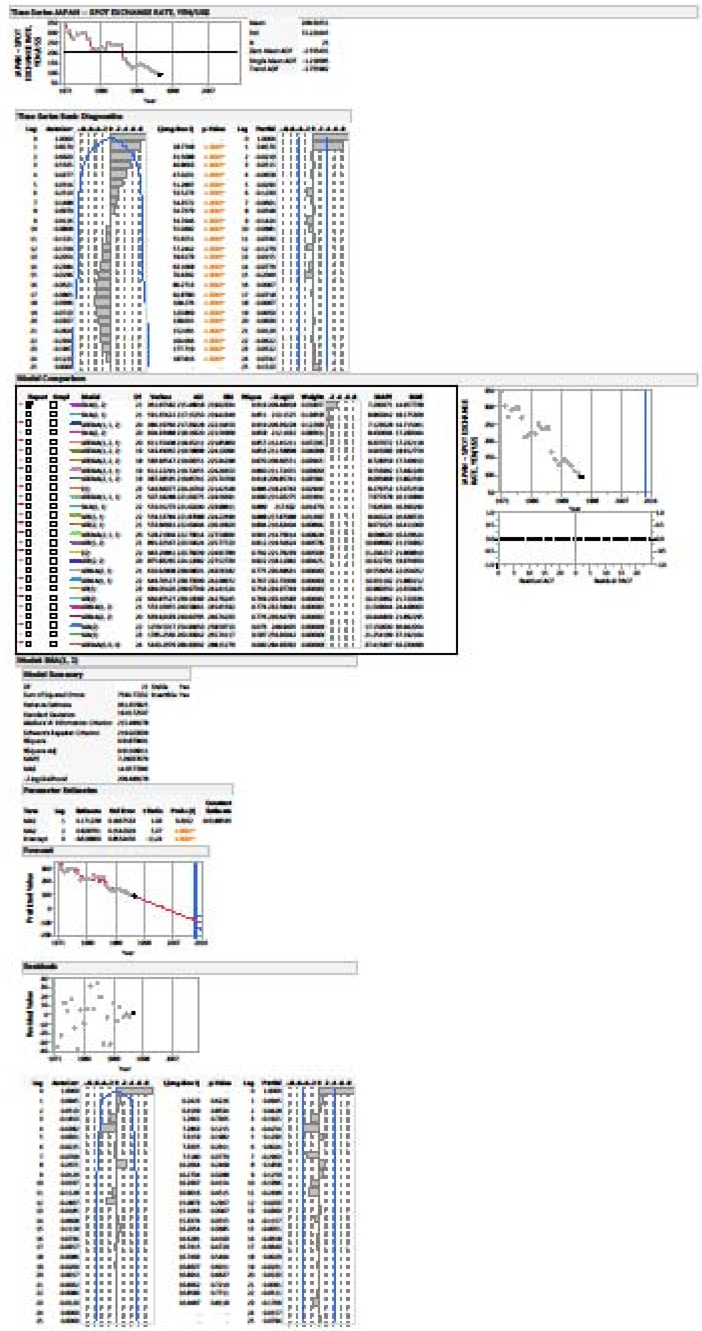




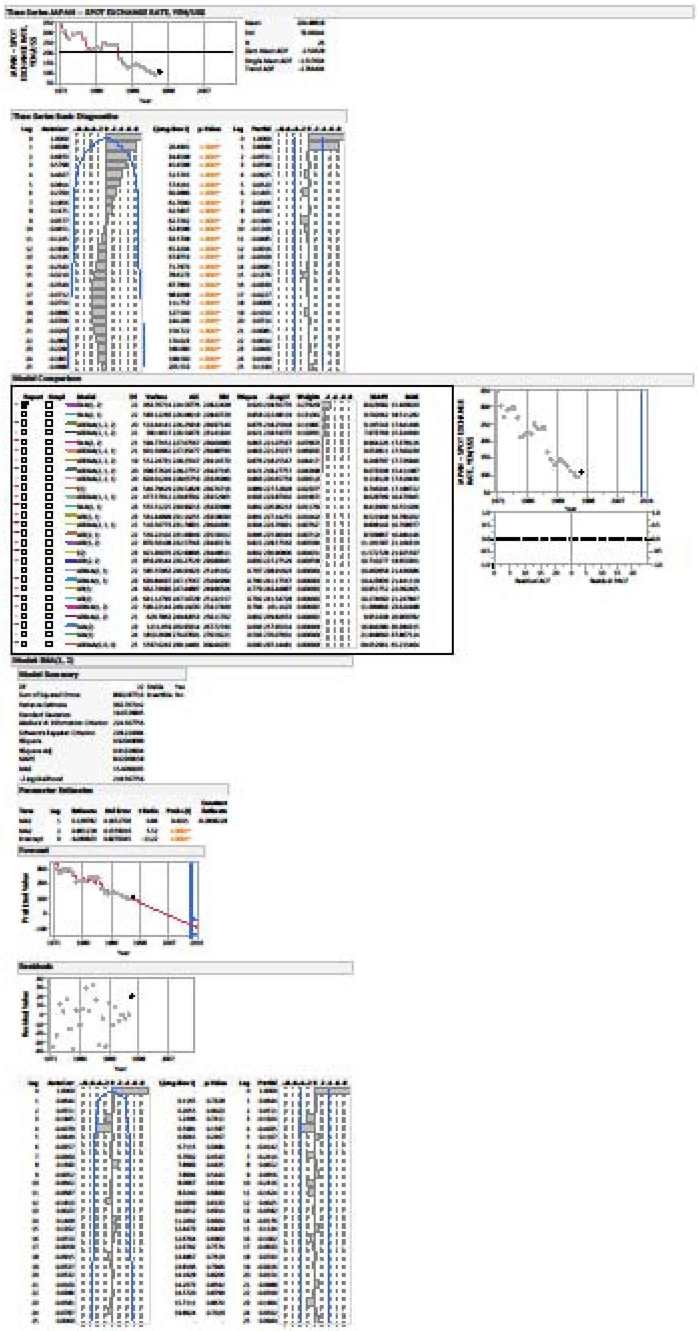


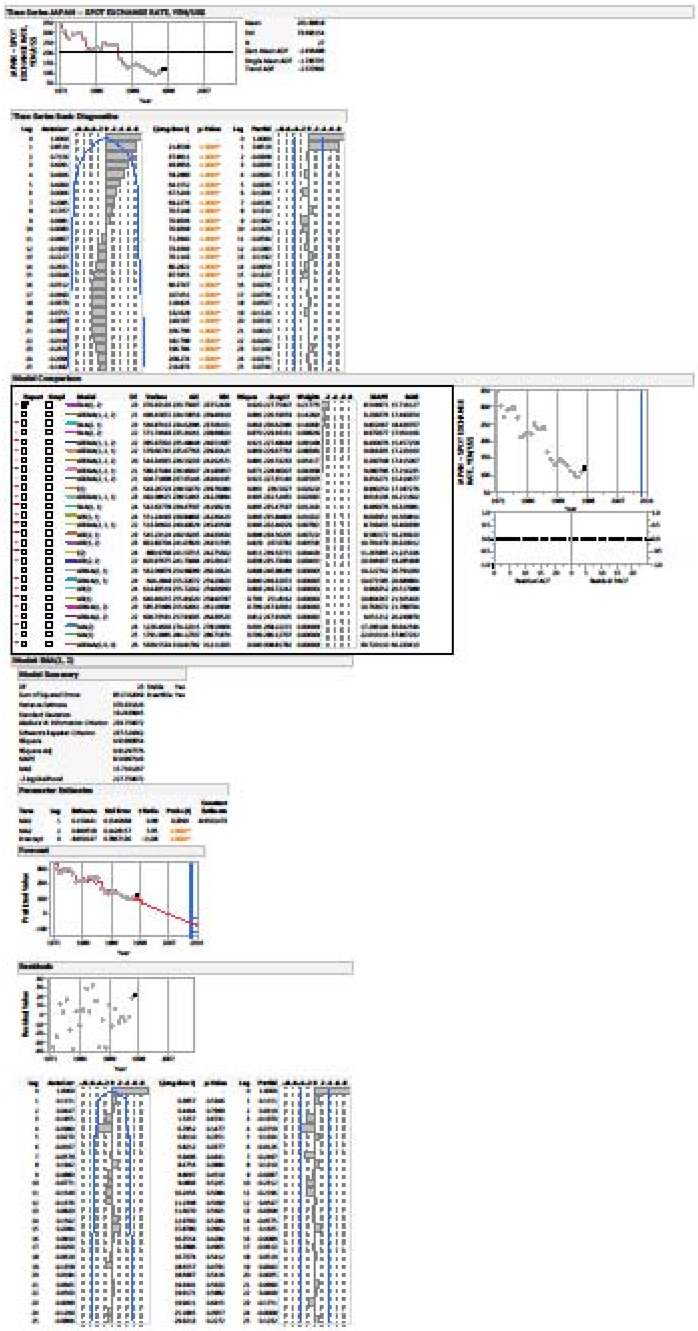


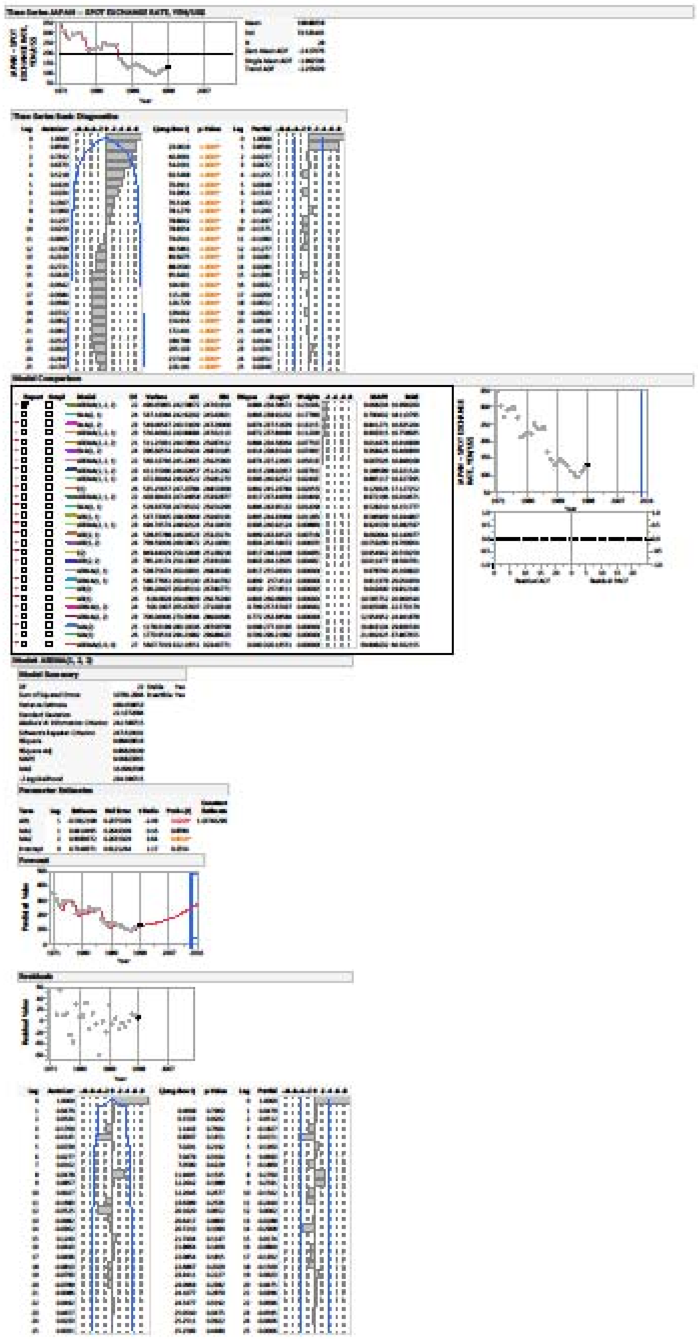




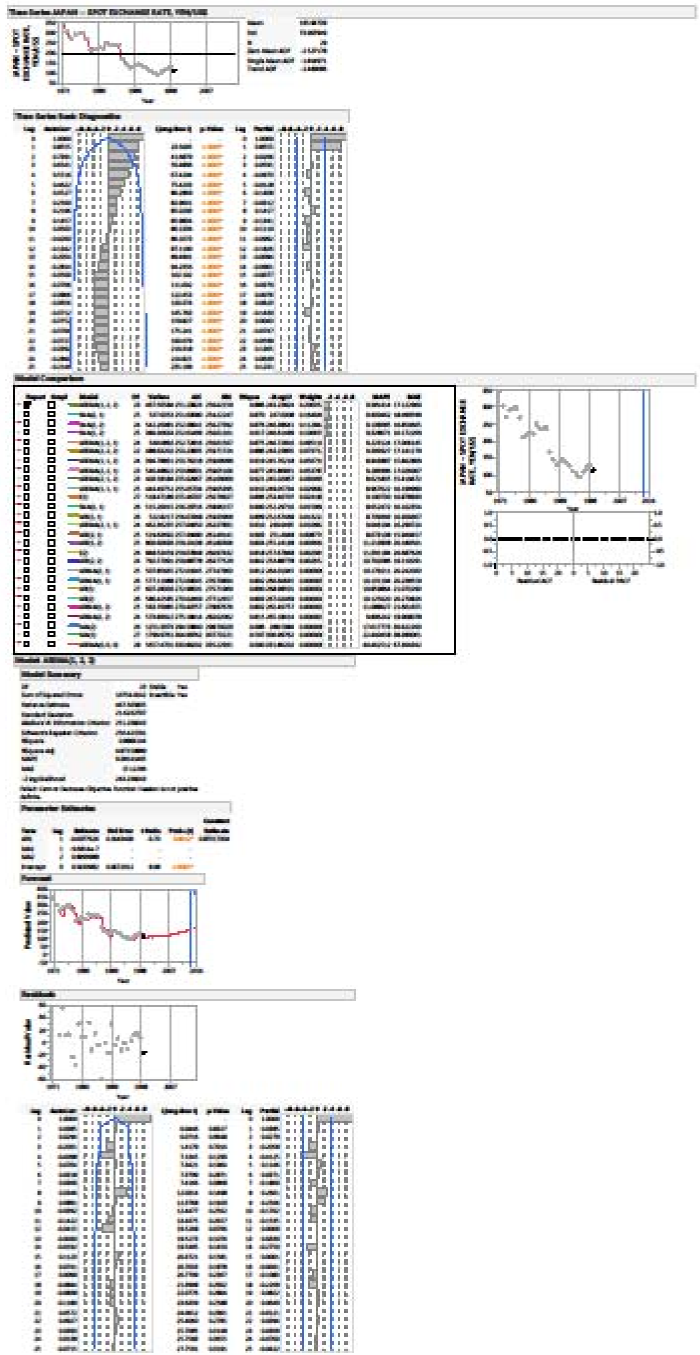
Japan - Time Series of JAPAN -- SPOT EXCHANGE RATE, YEN/US$

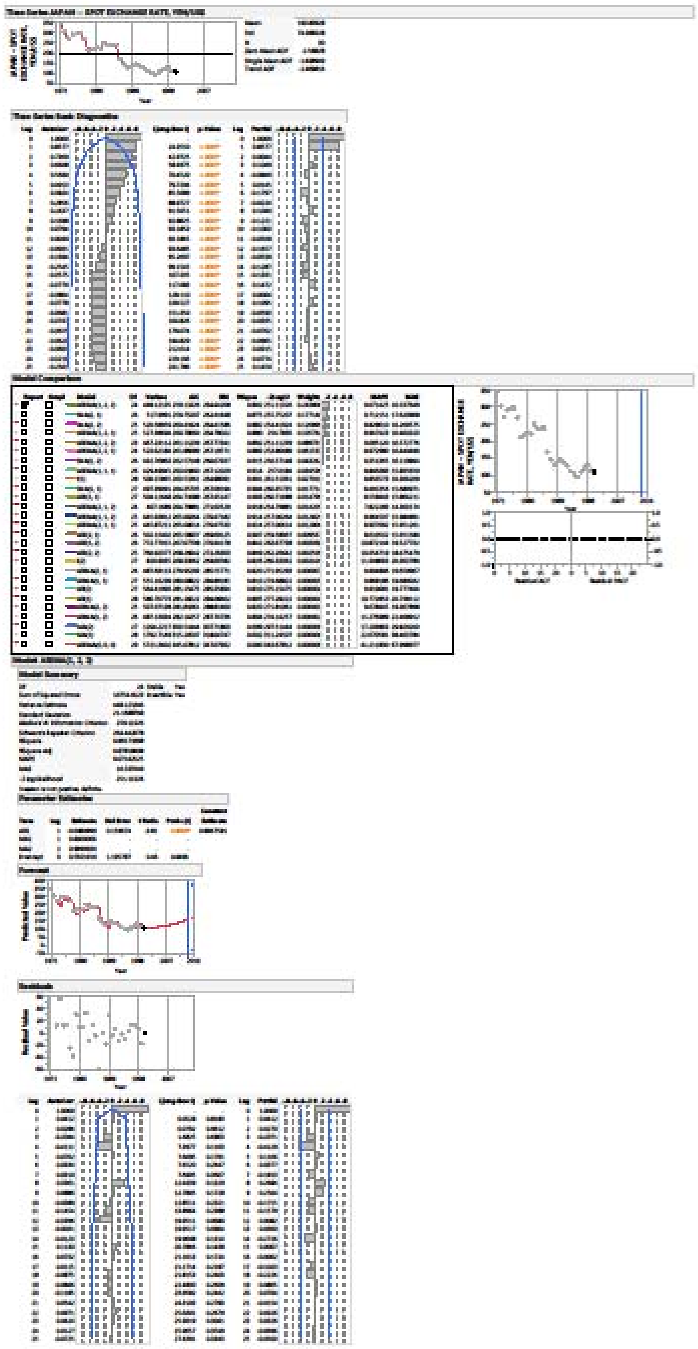


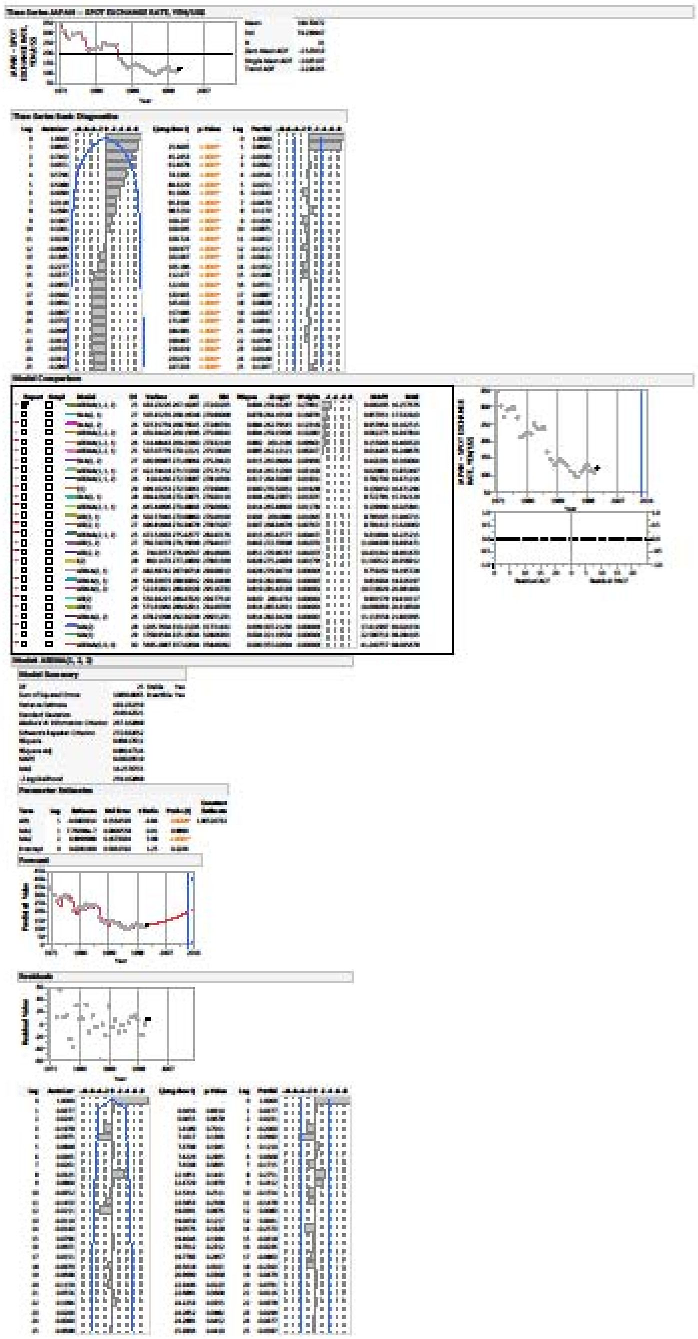


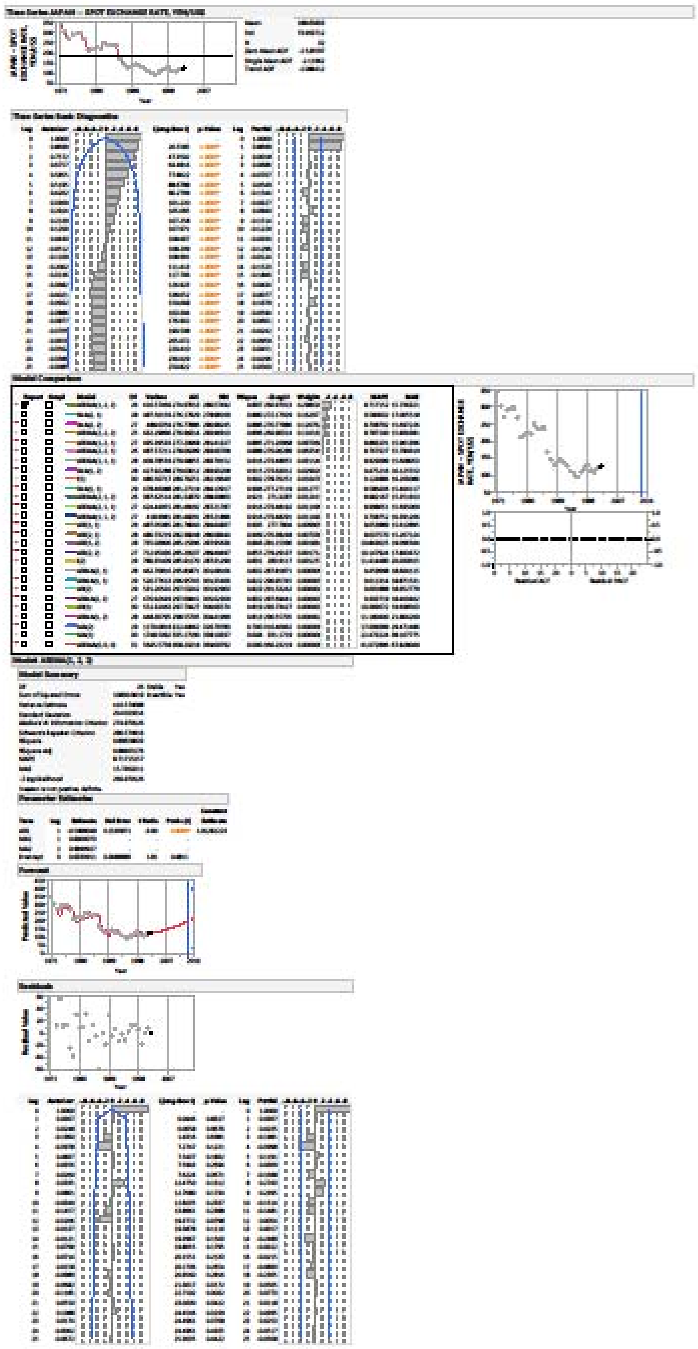


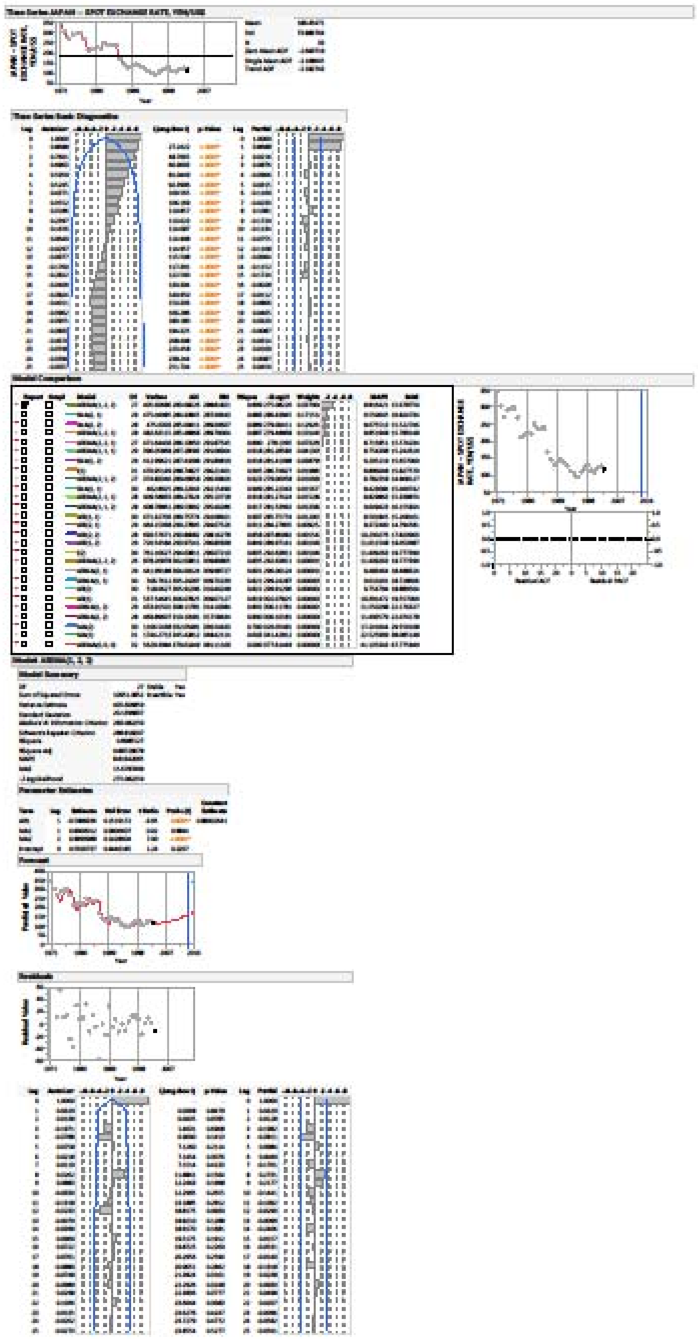
Japan - Time Series of JAPAN -- SPOT EXCHANGE RATE, YEN/US$

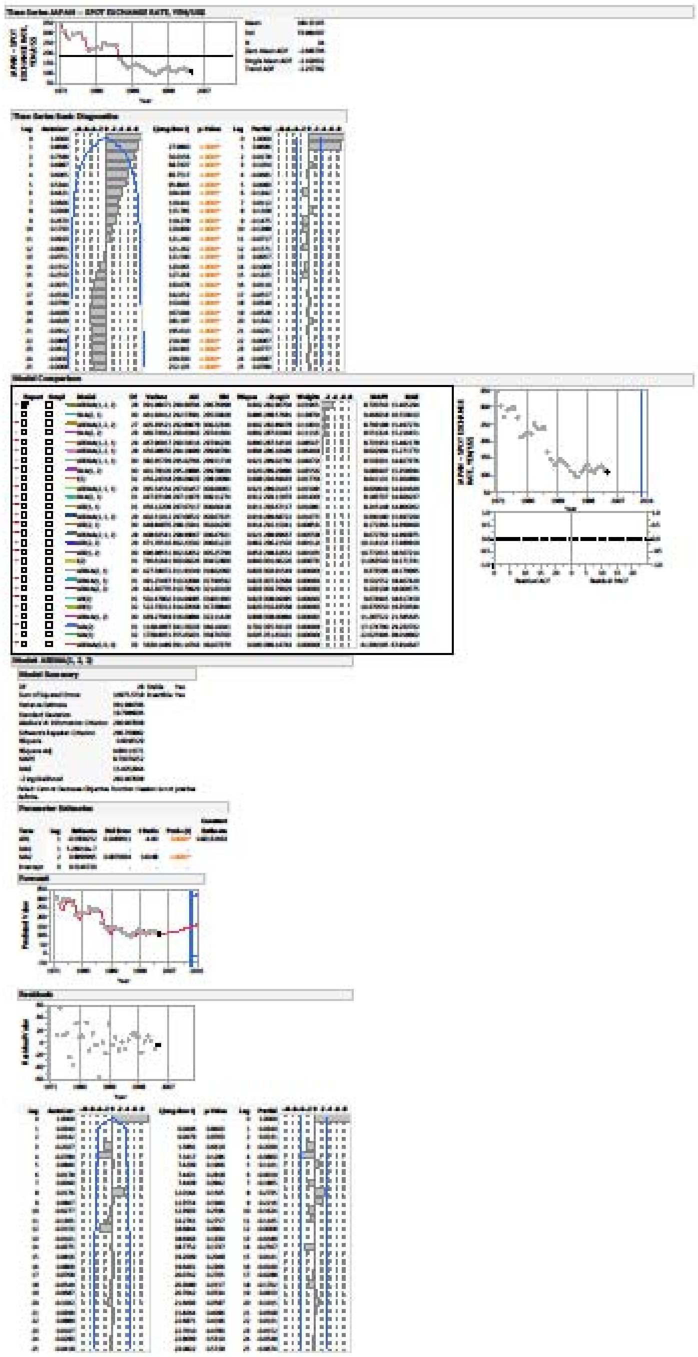


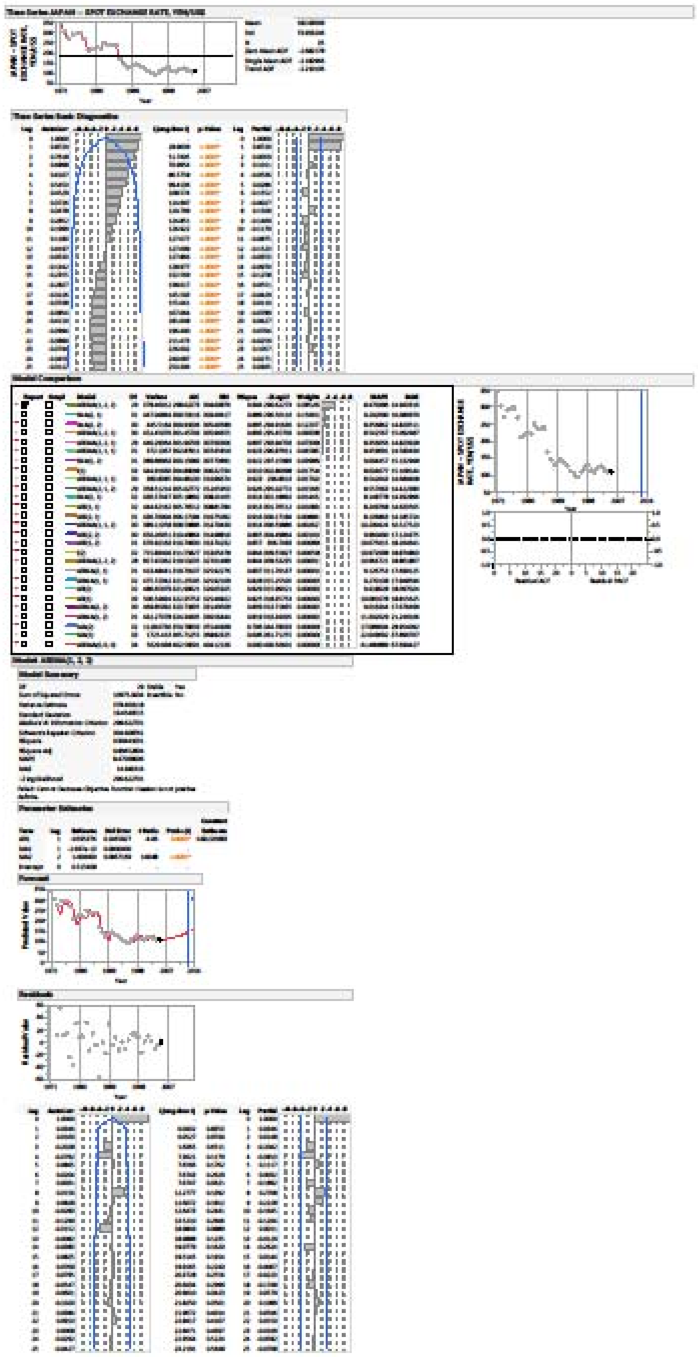


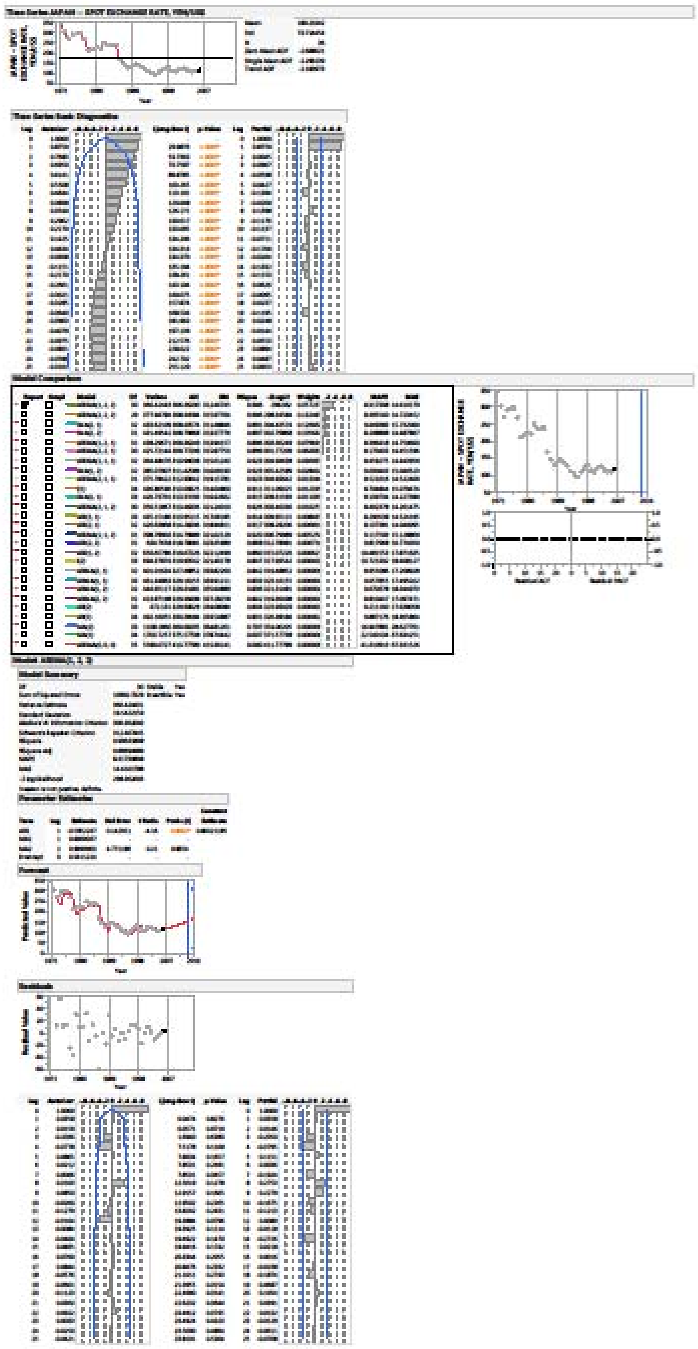


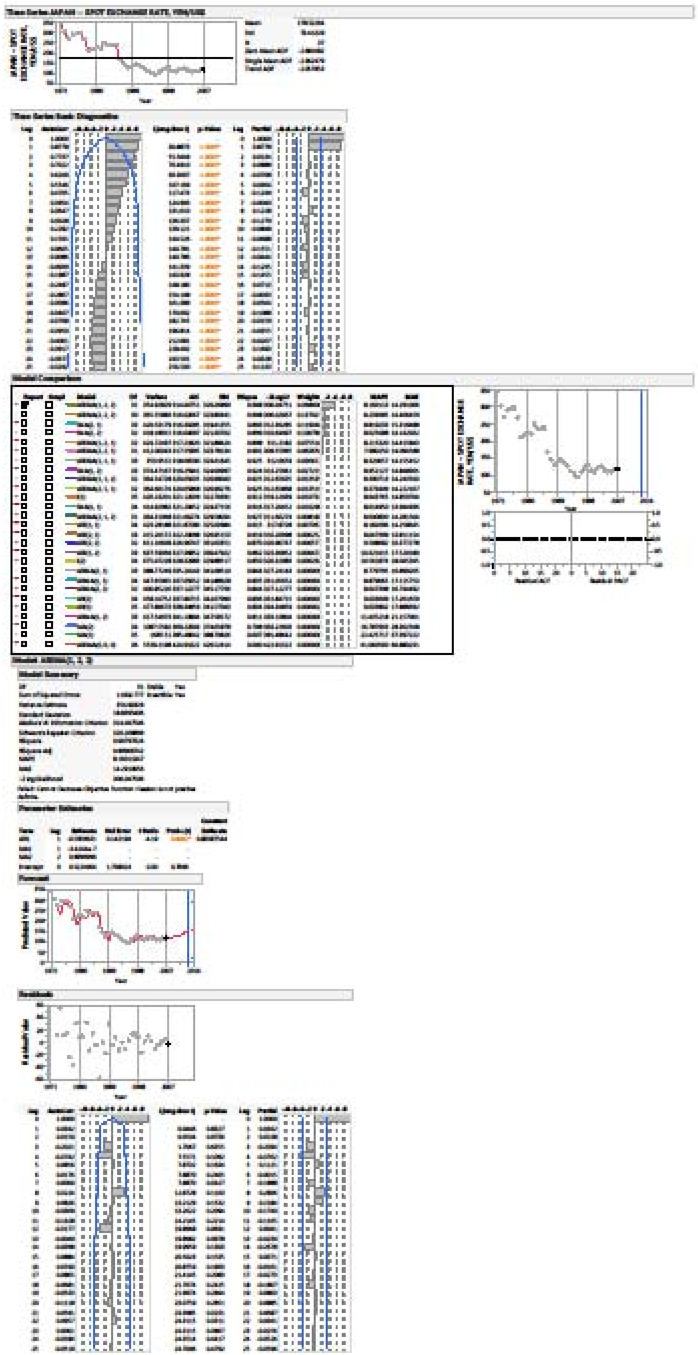


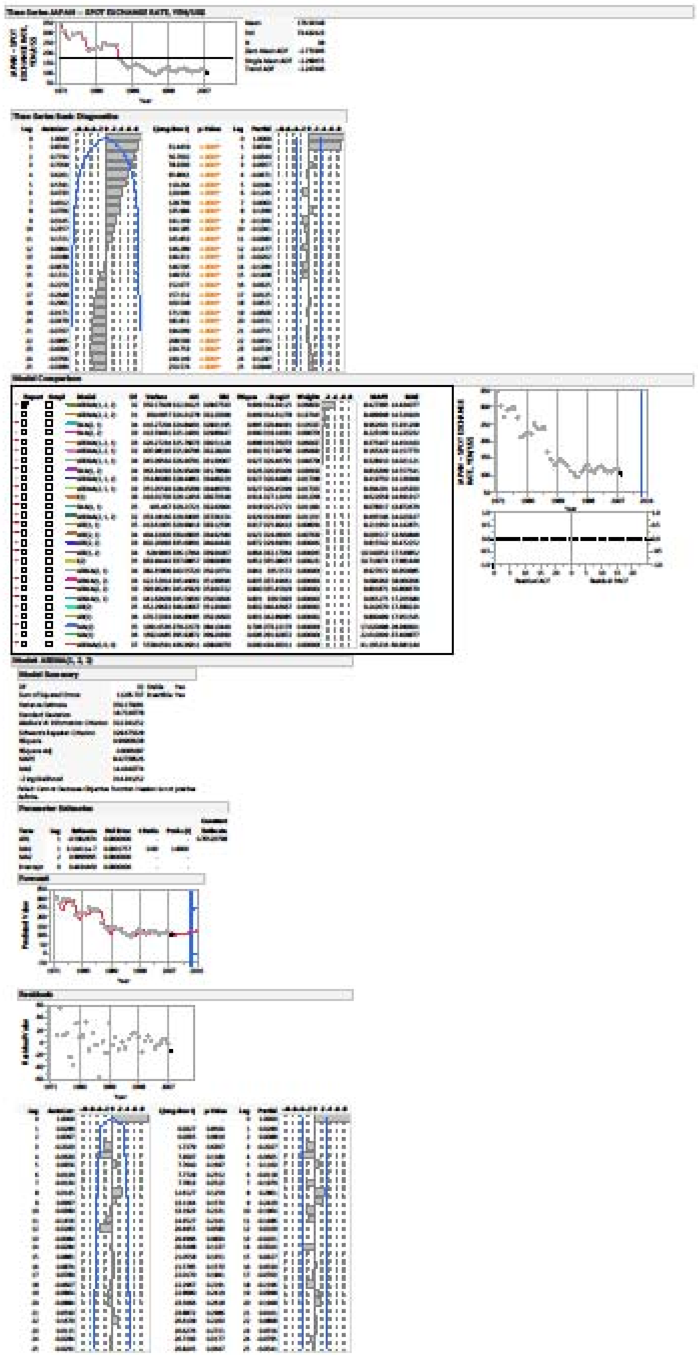


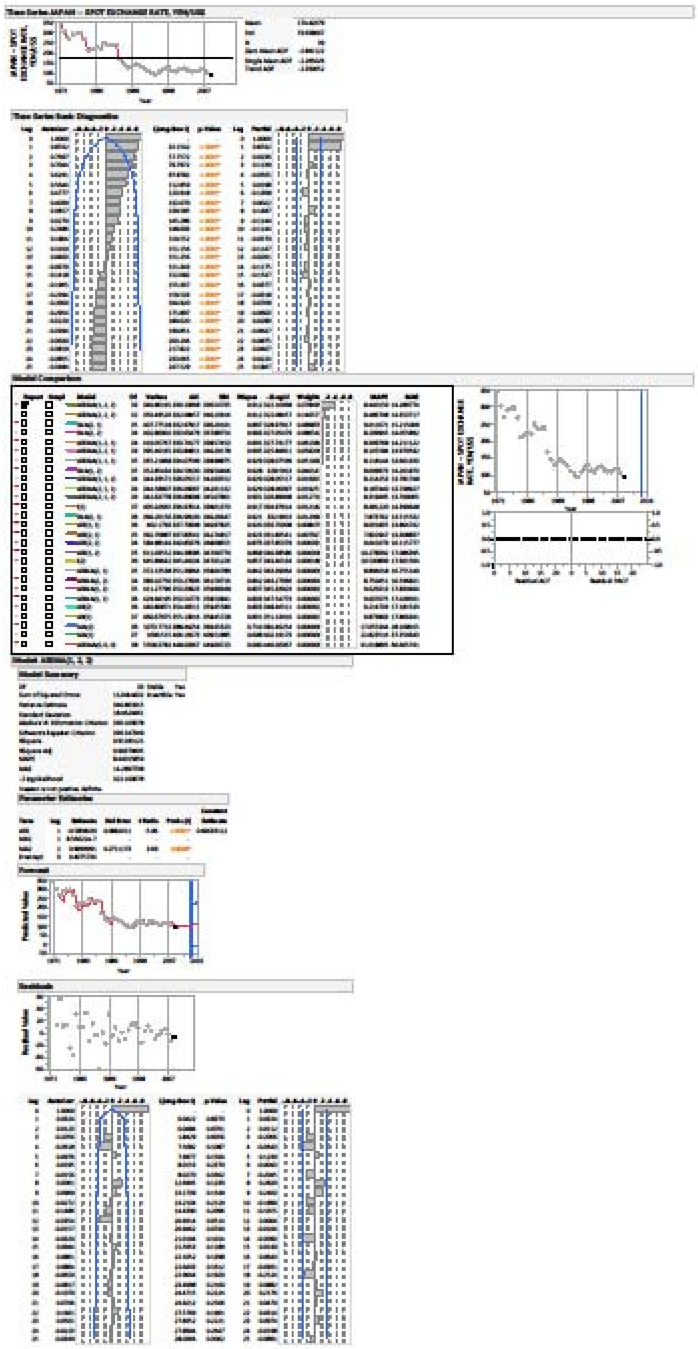


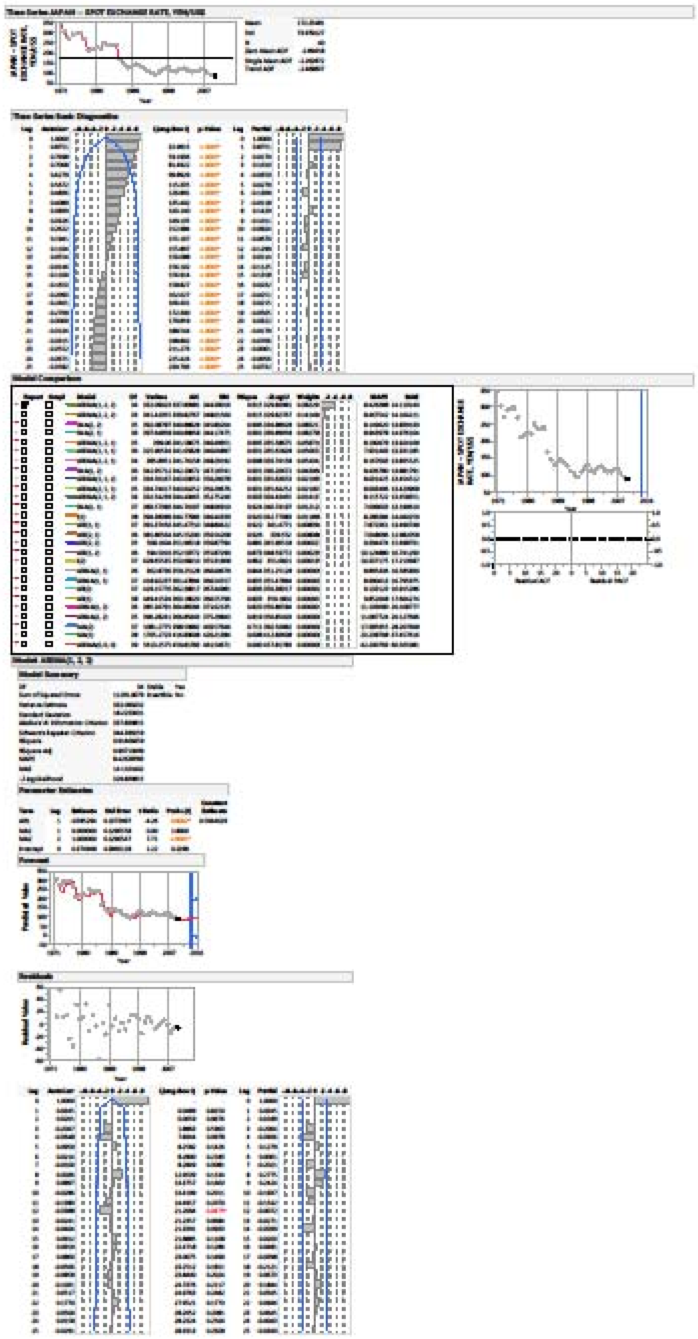




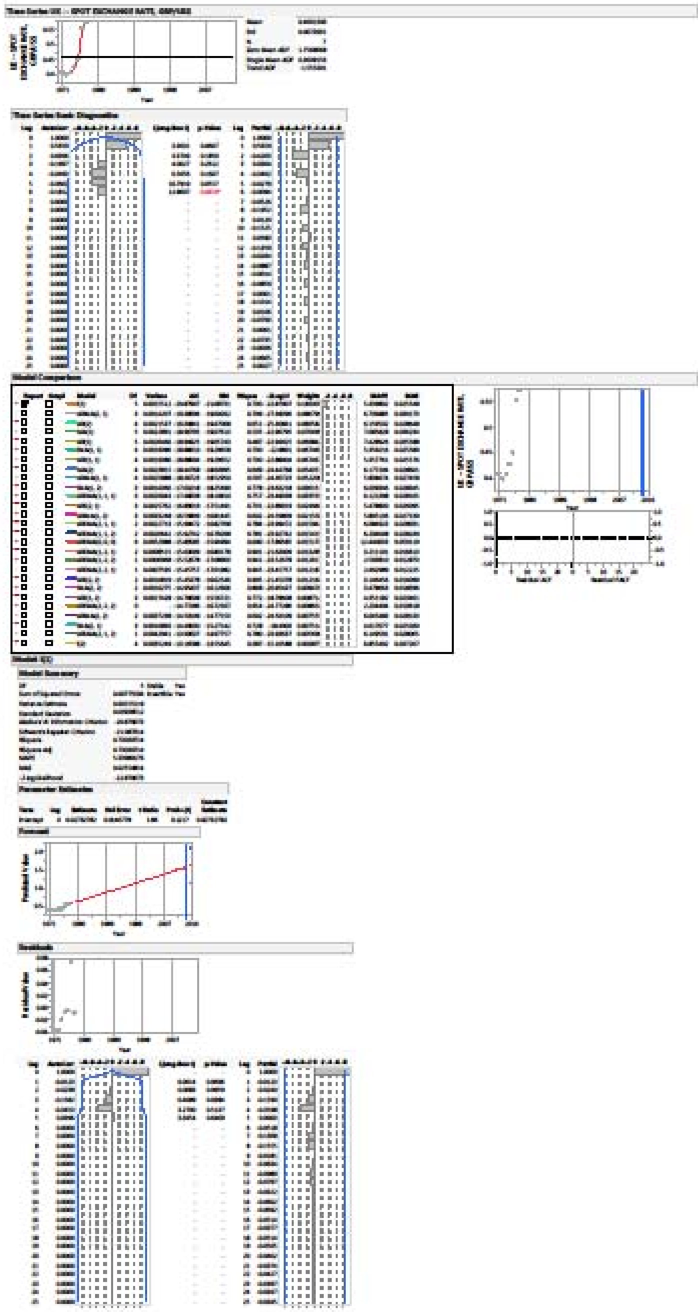


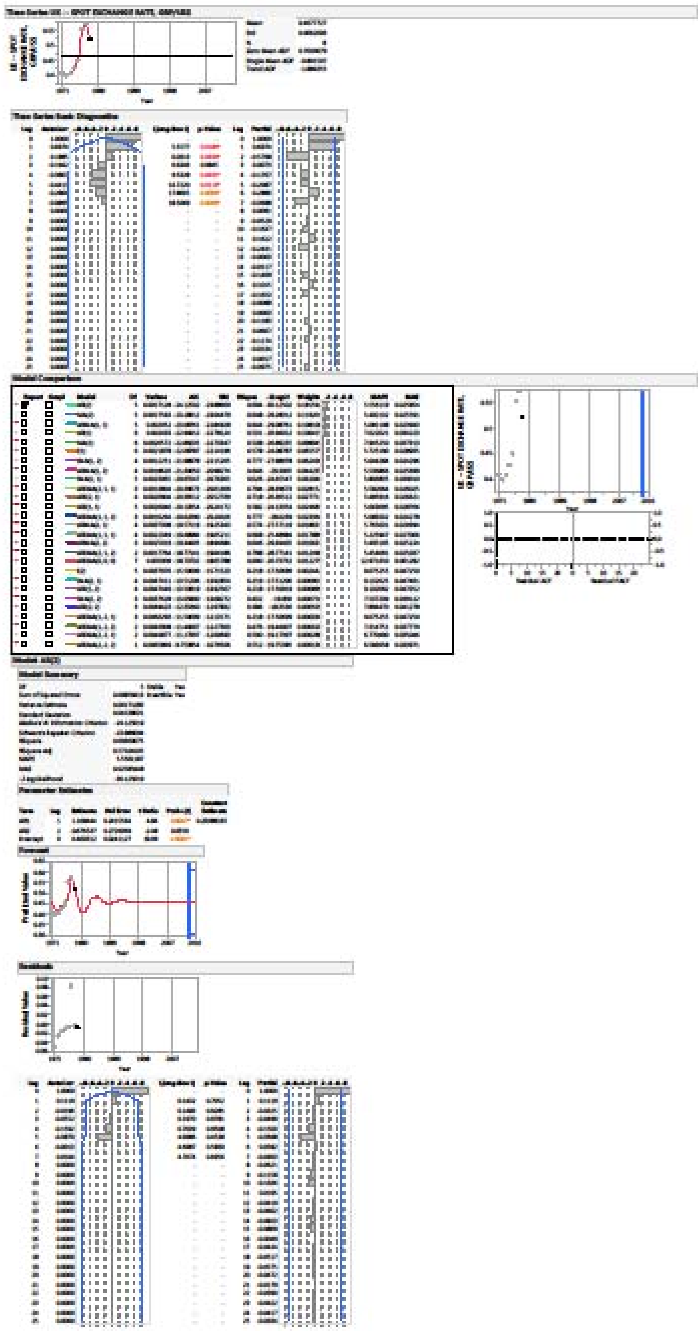


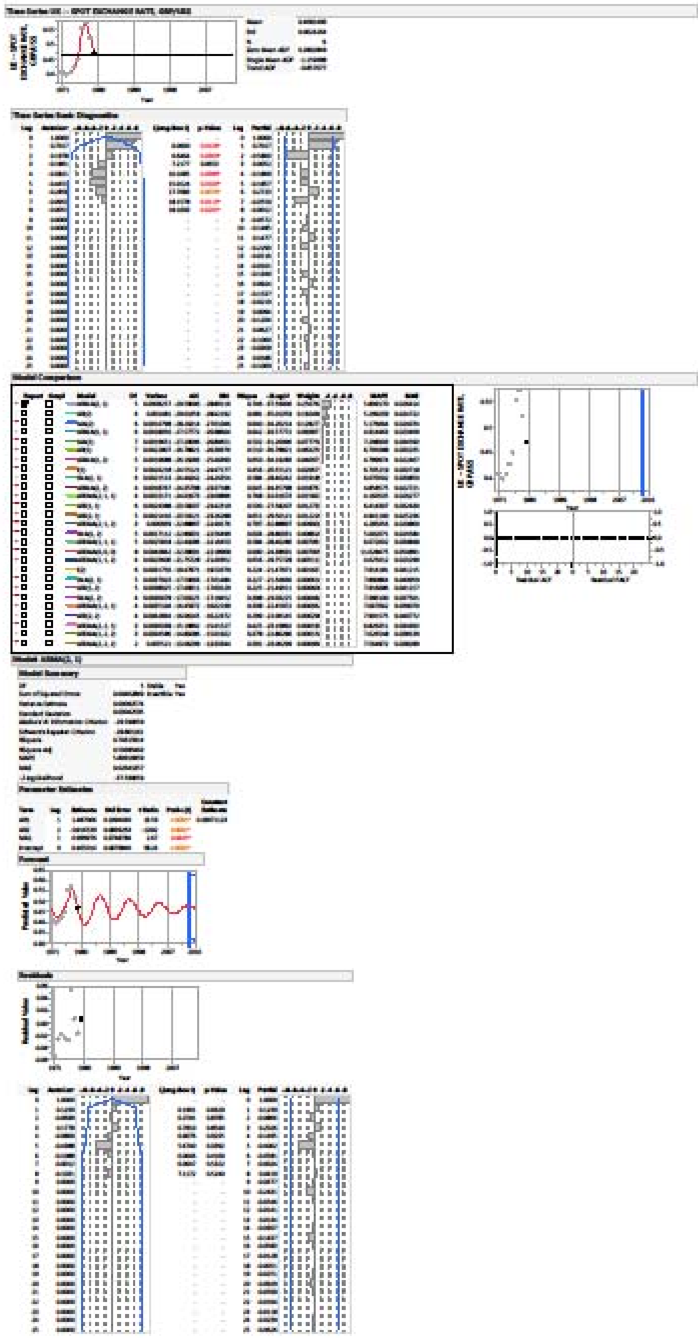




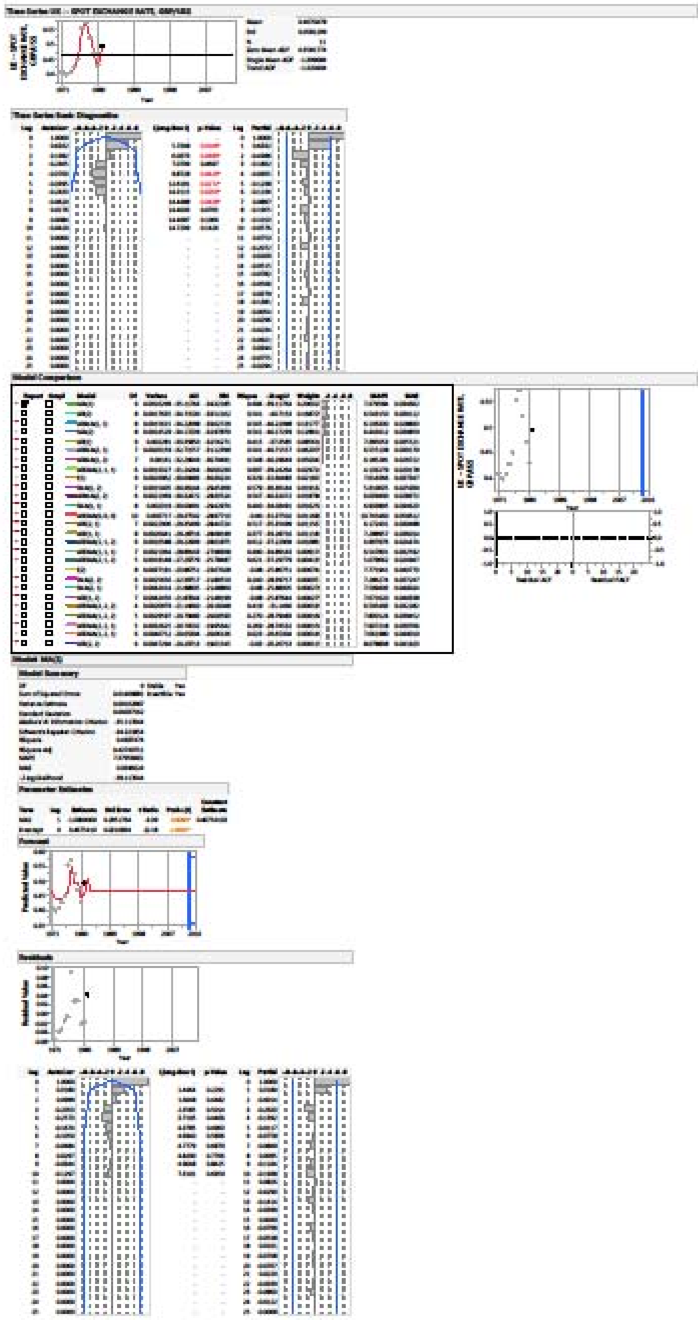
United Kingdom



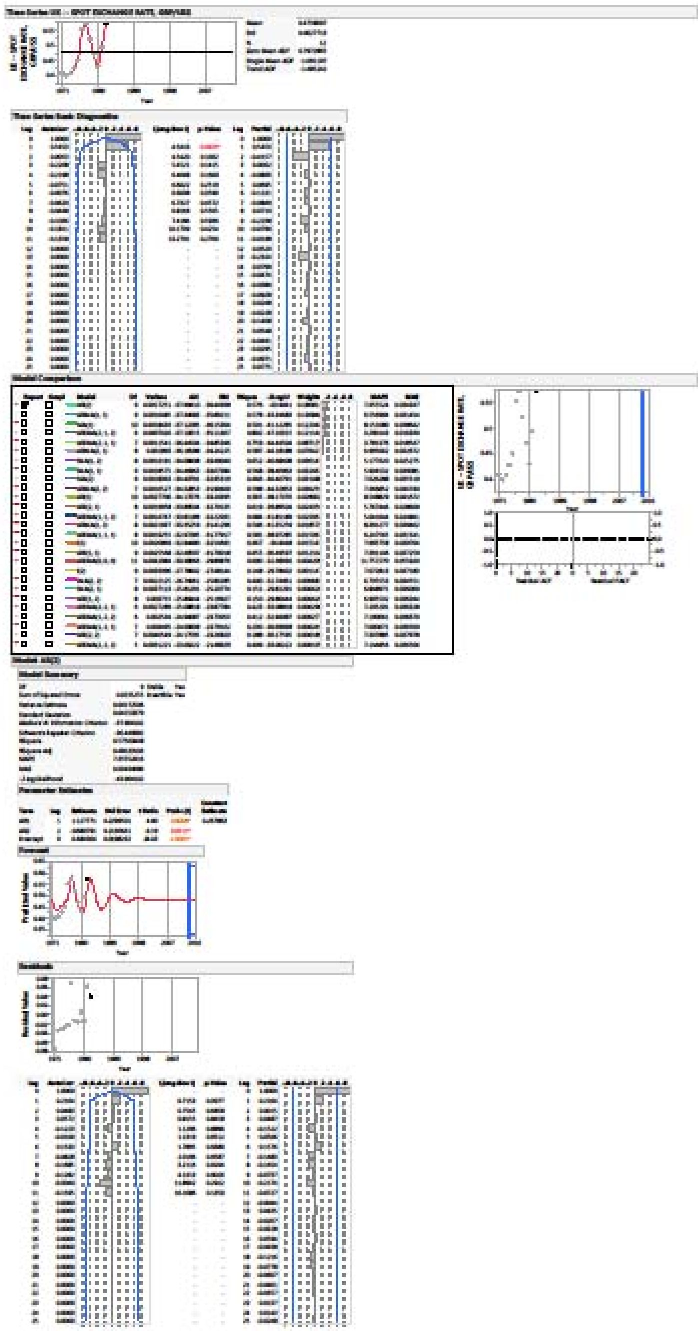


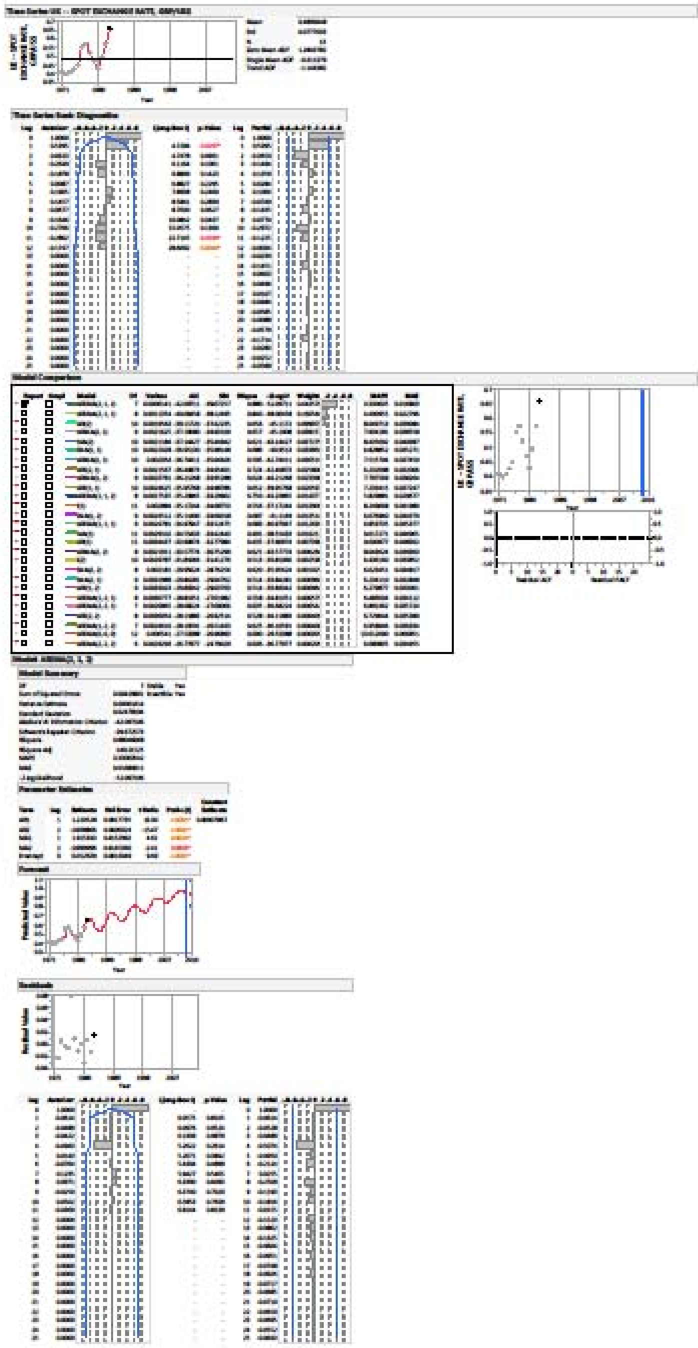


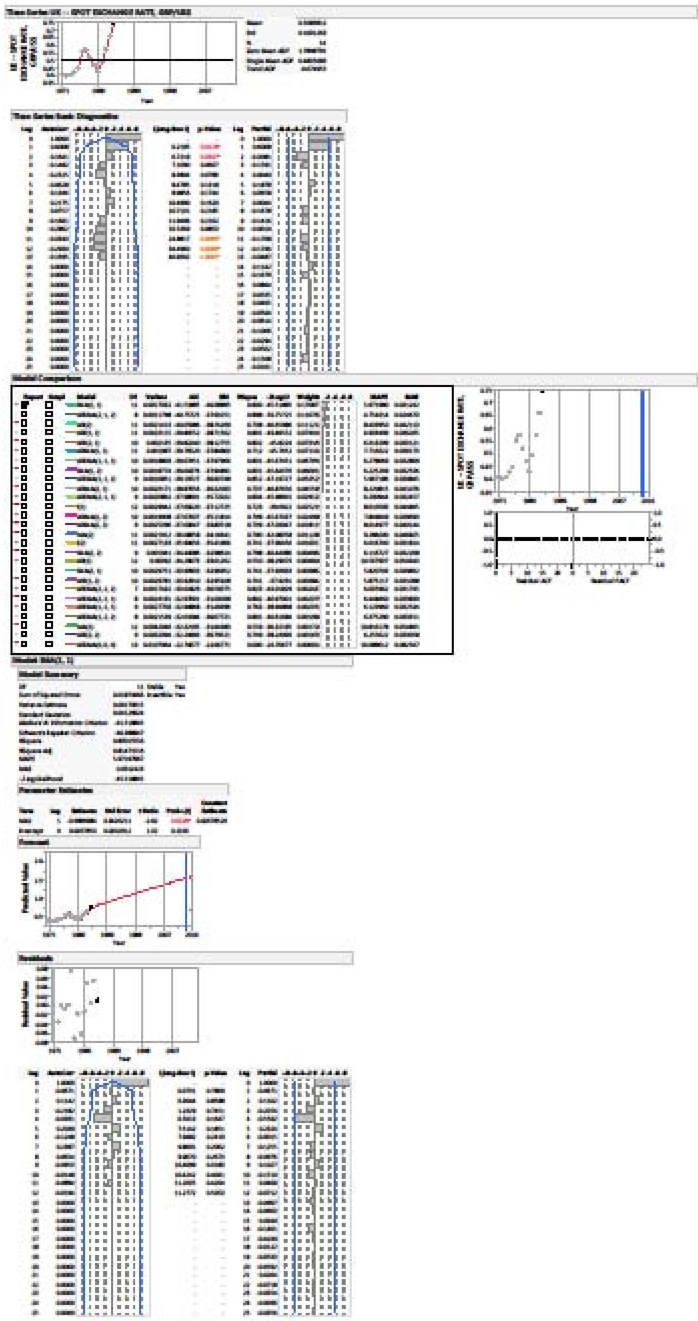
UK - Time Series of UK -- SPOT EXCHANGE RATE, GBP/US$

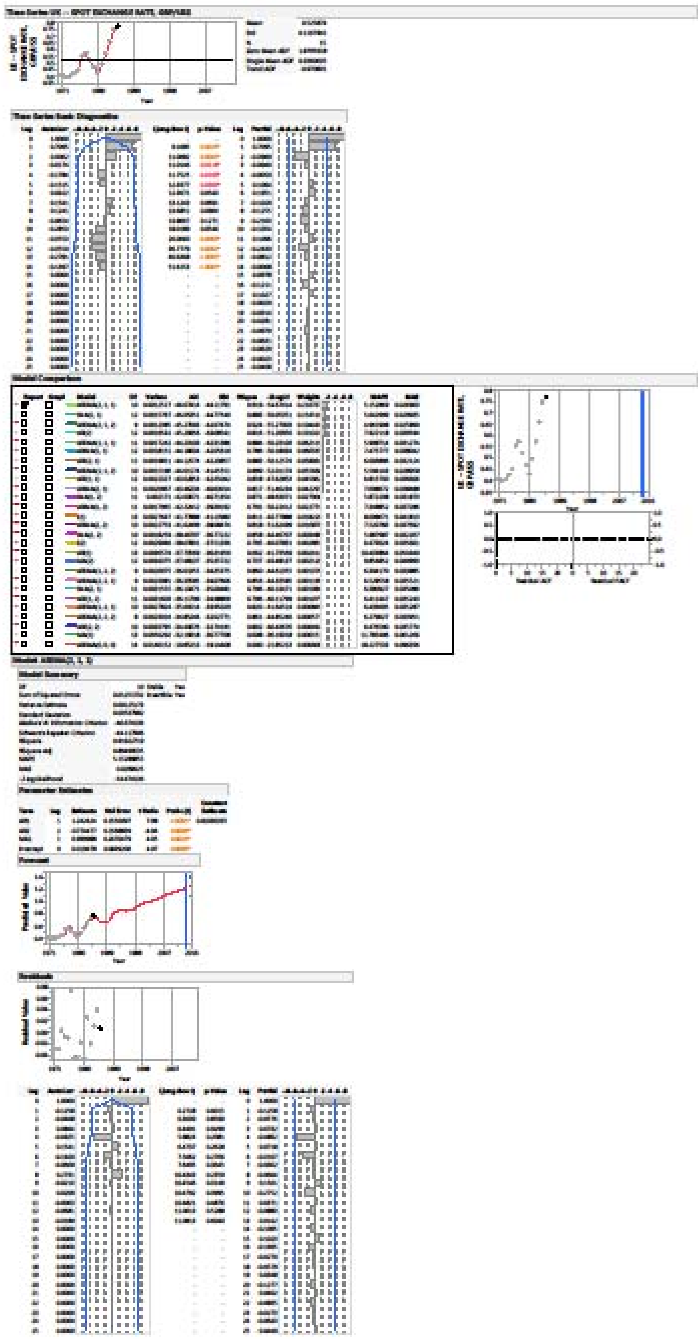


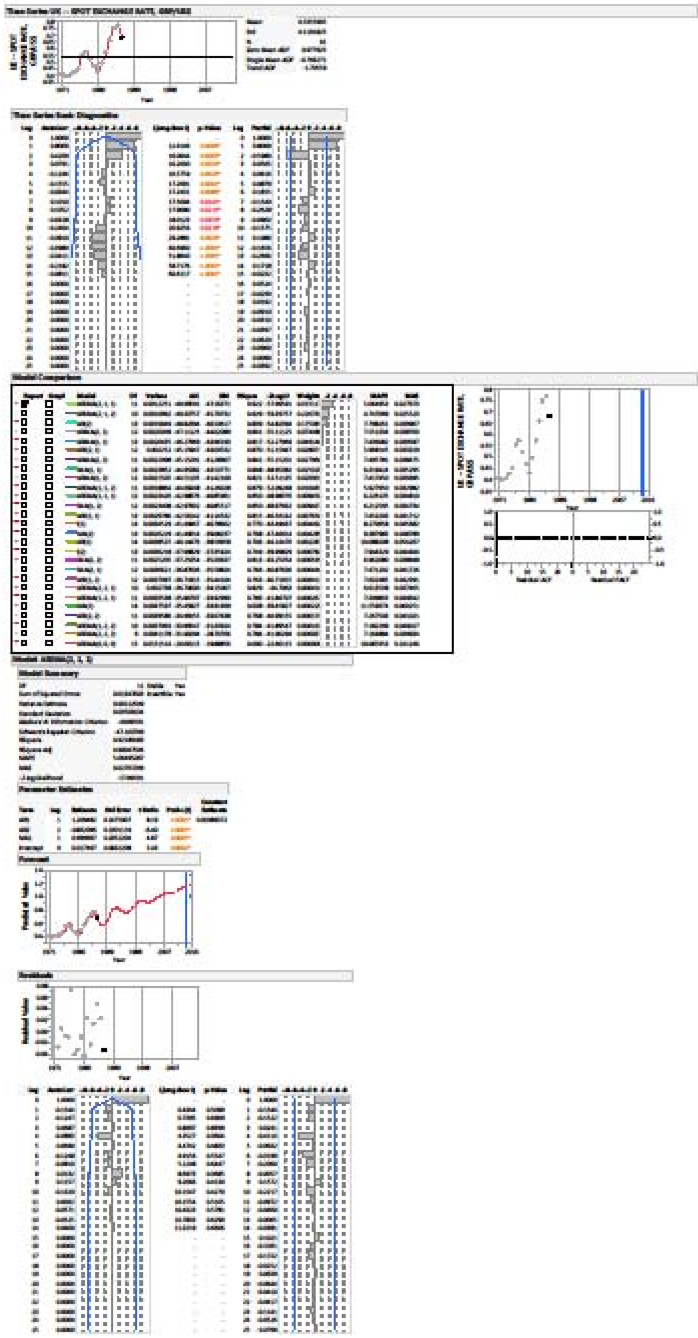
UK - Time Series of UK -- SPOT EXCHANGE RATE, GBP/US$ Page 1 of 1

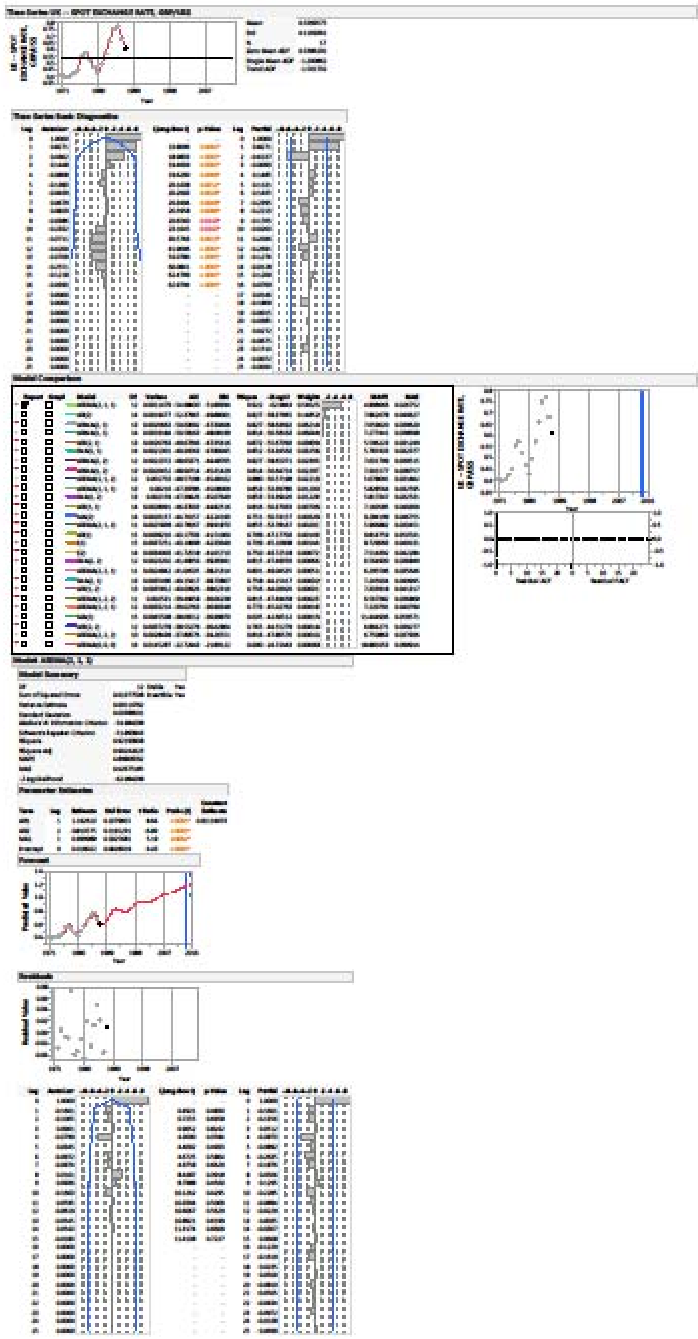




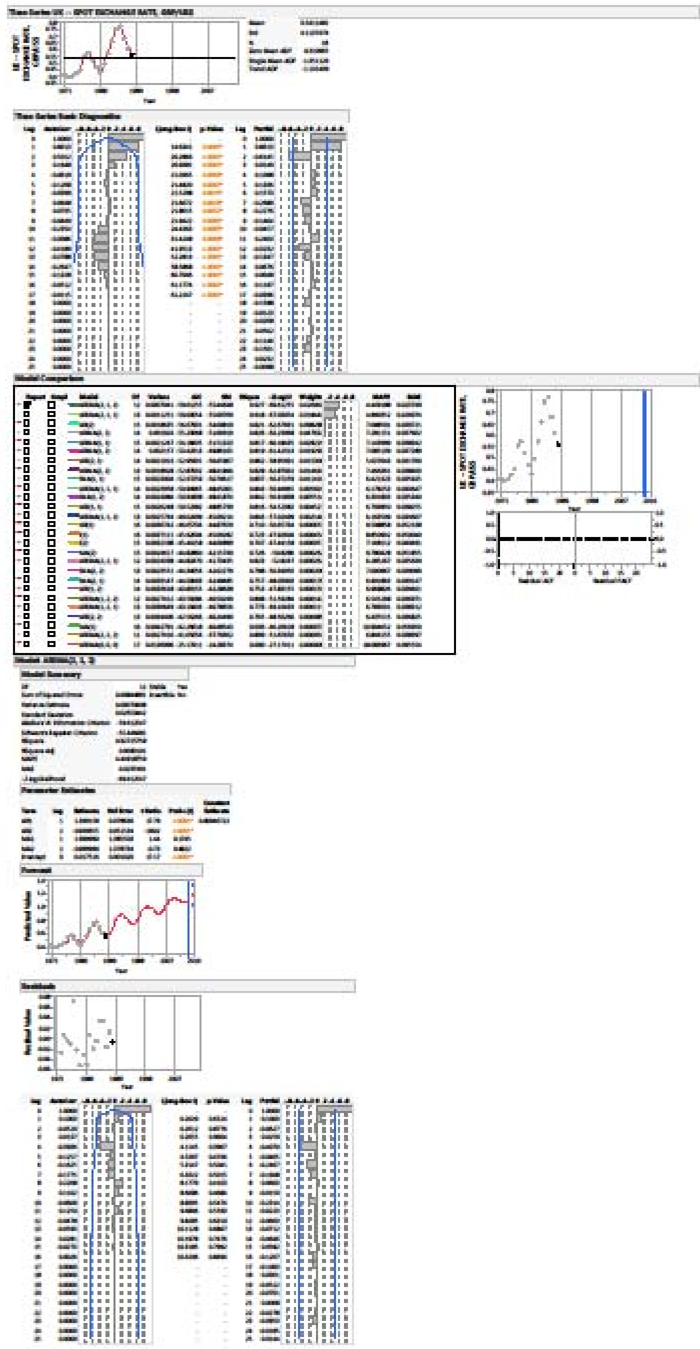


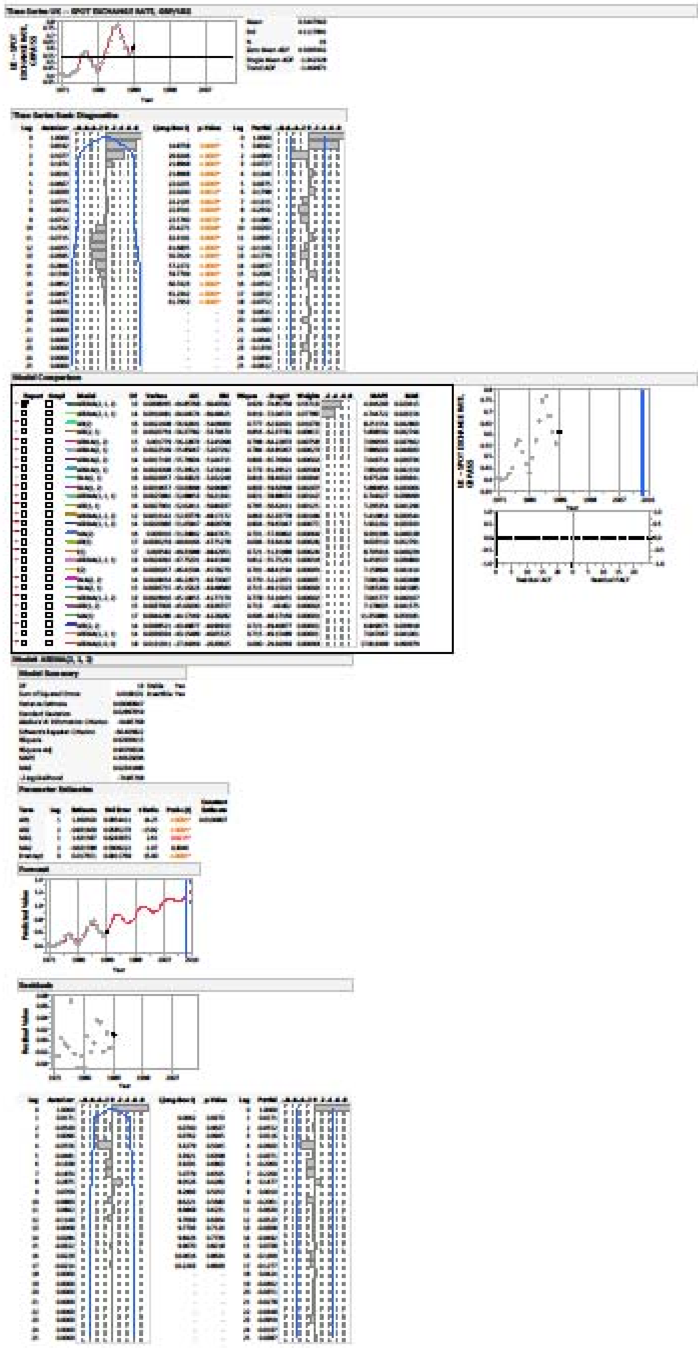


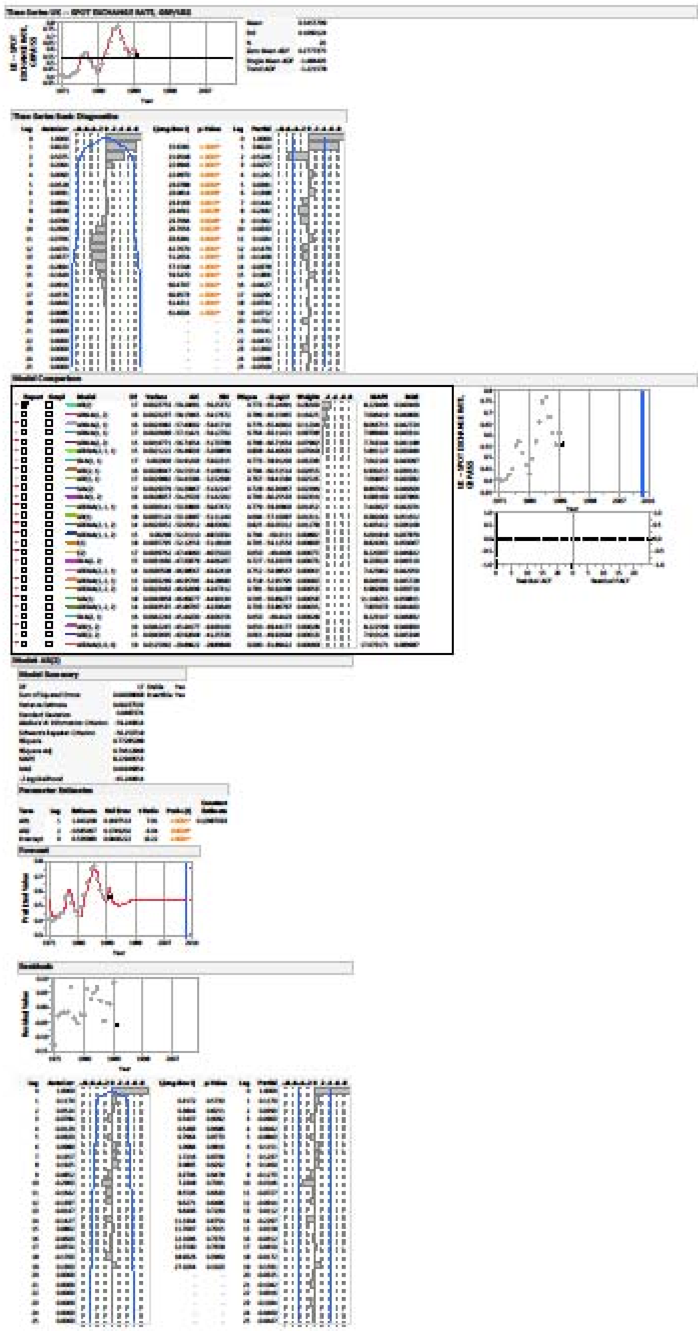


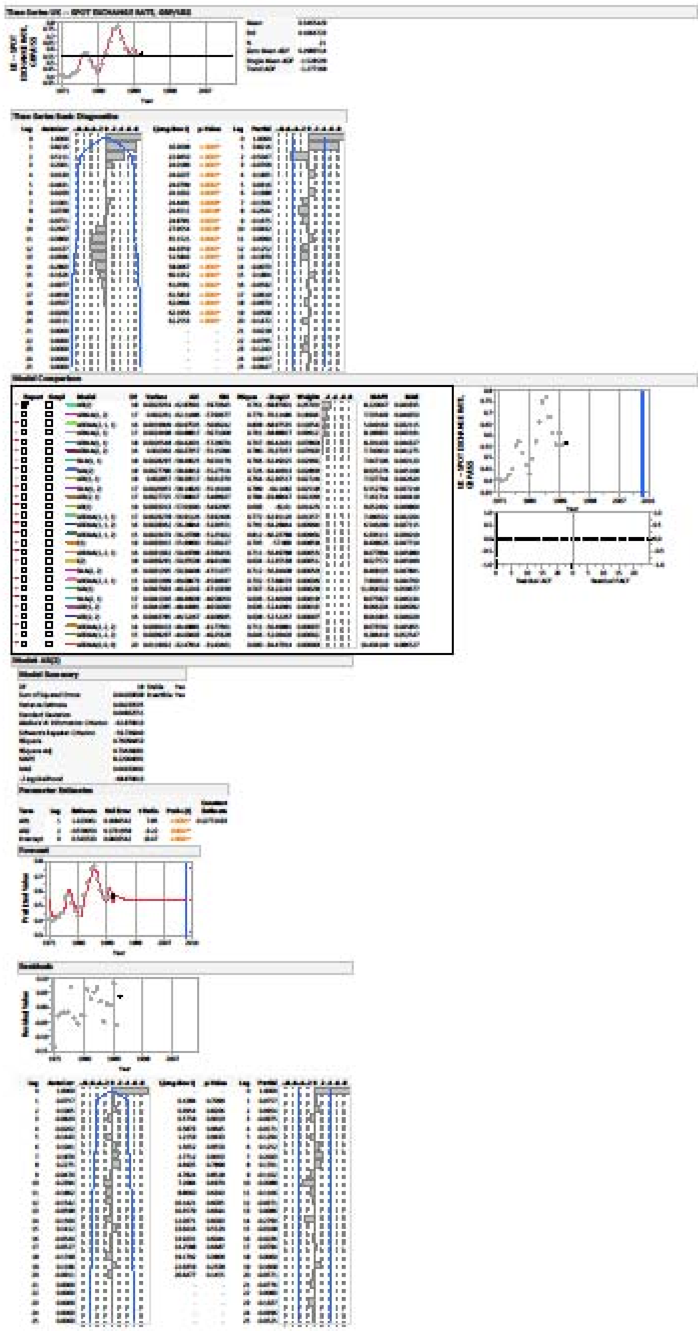


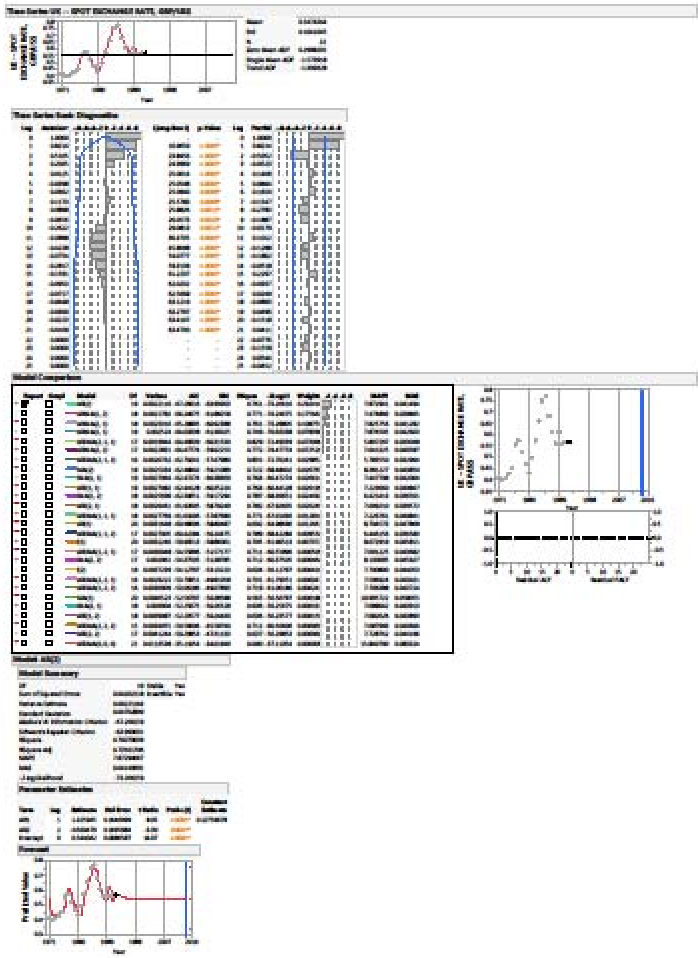
UK - Time Series of UK -- SPOT EXCHANGE RATE, GBP/US$ 2

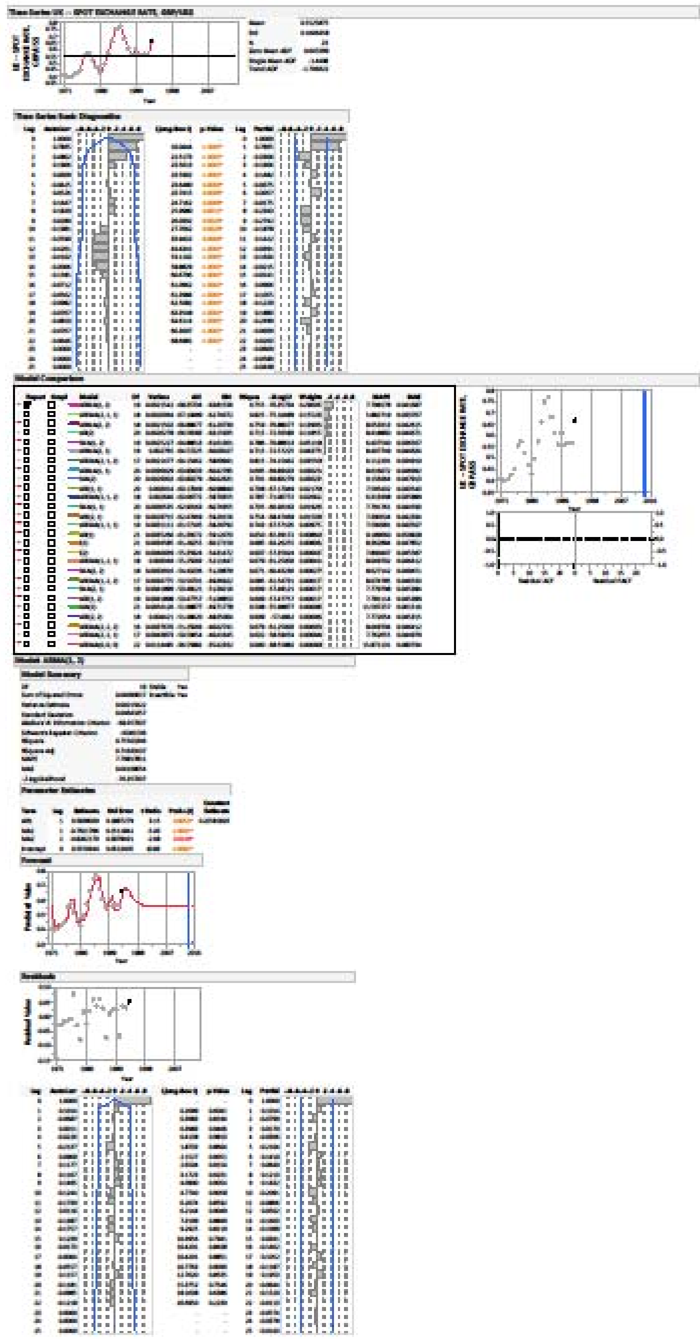


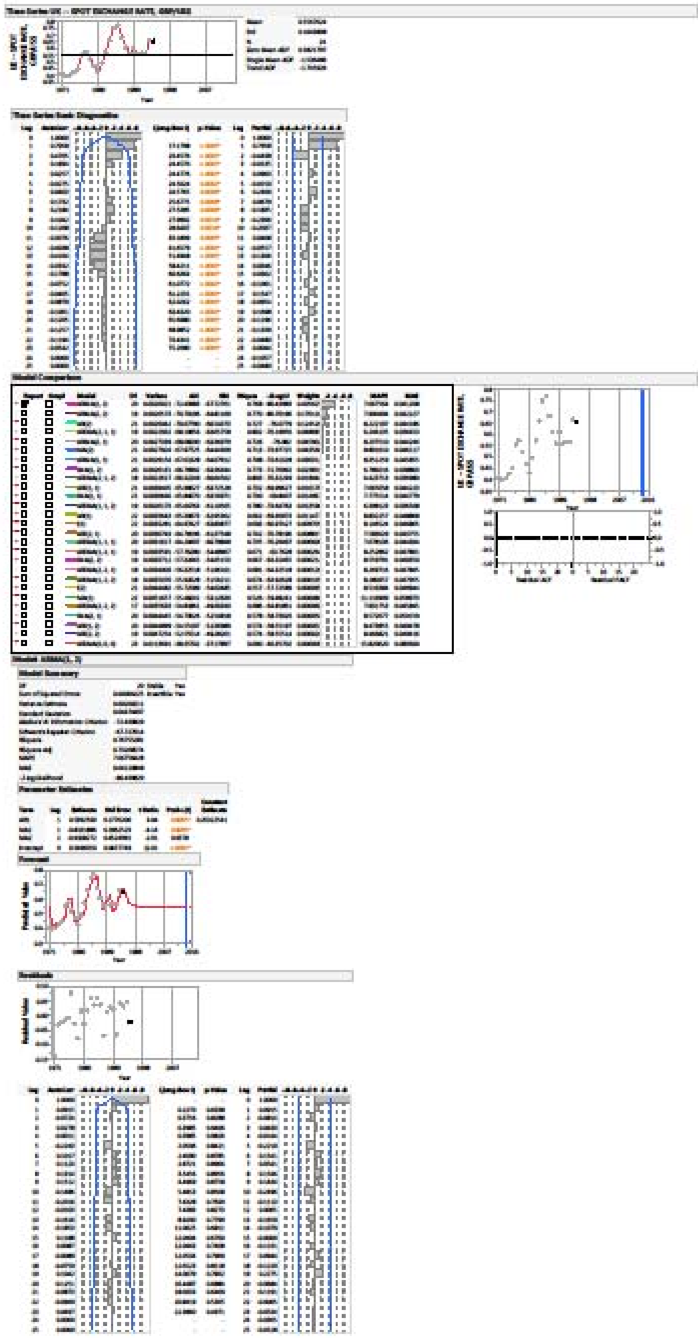


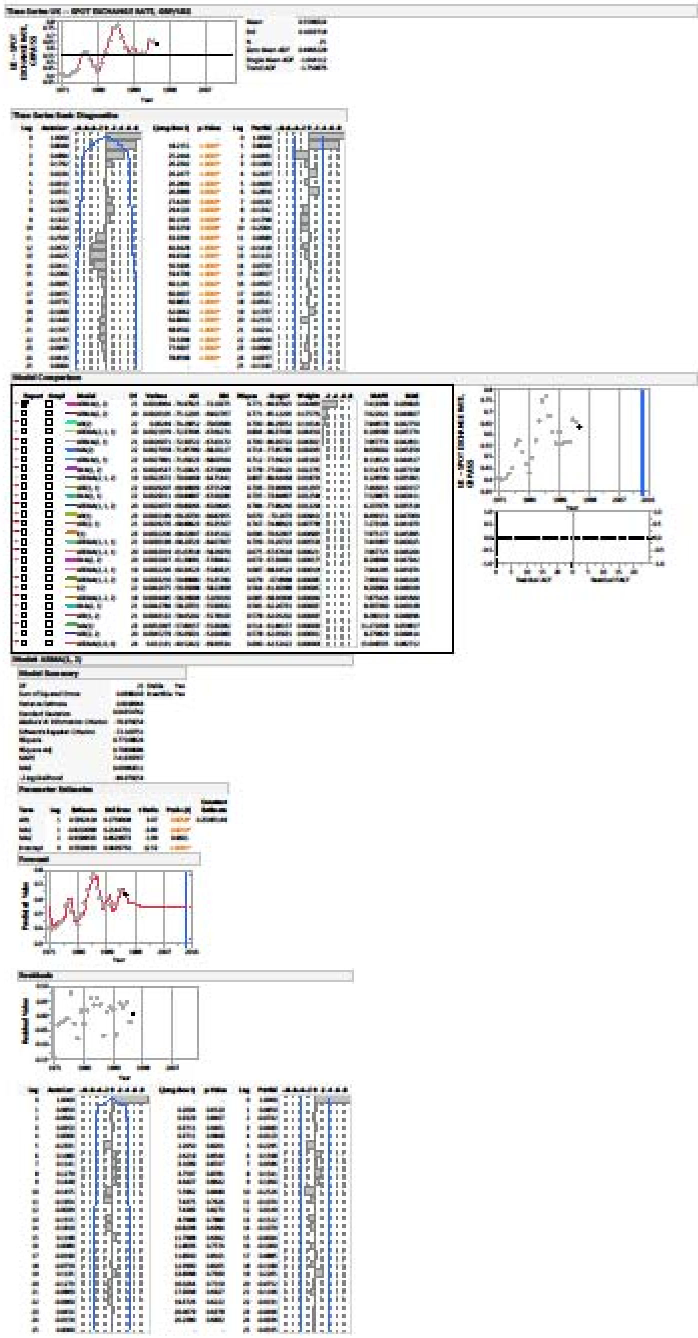


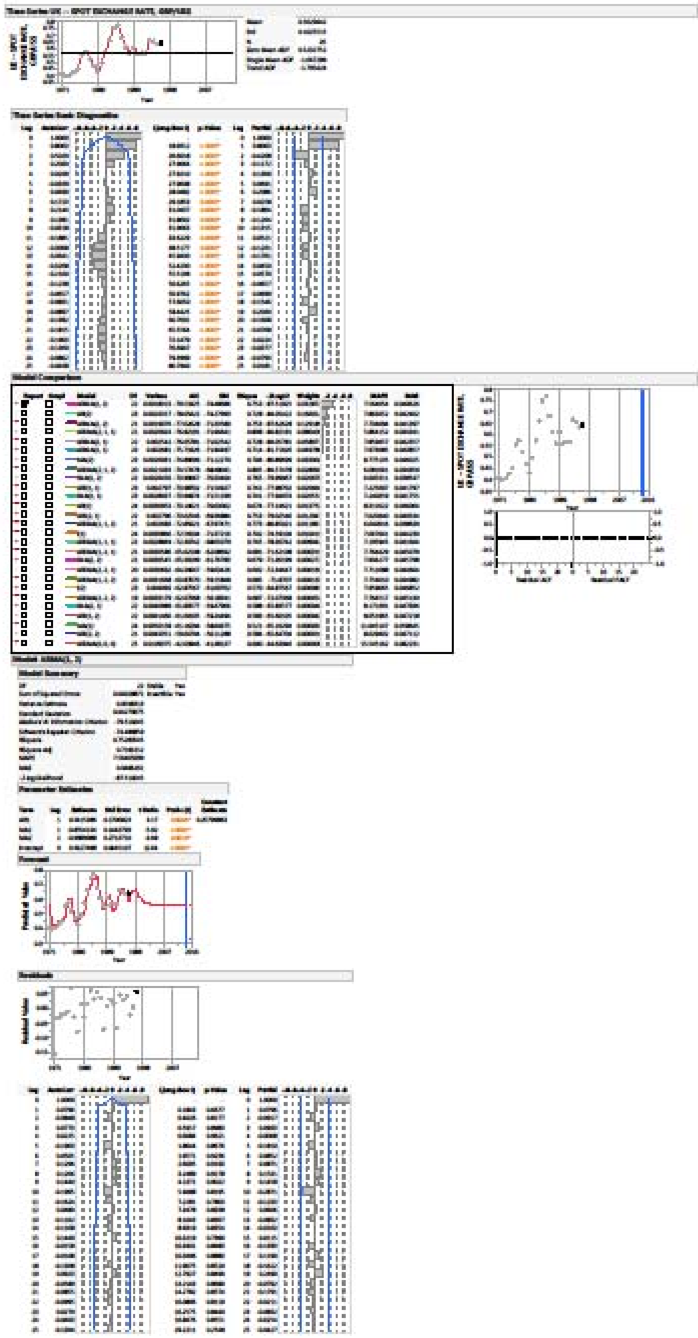


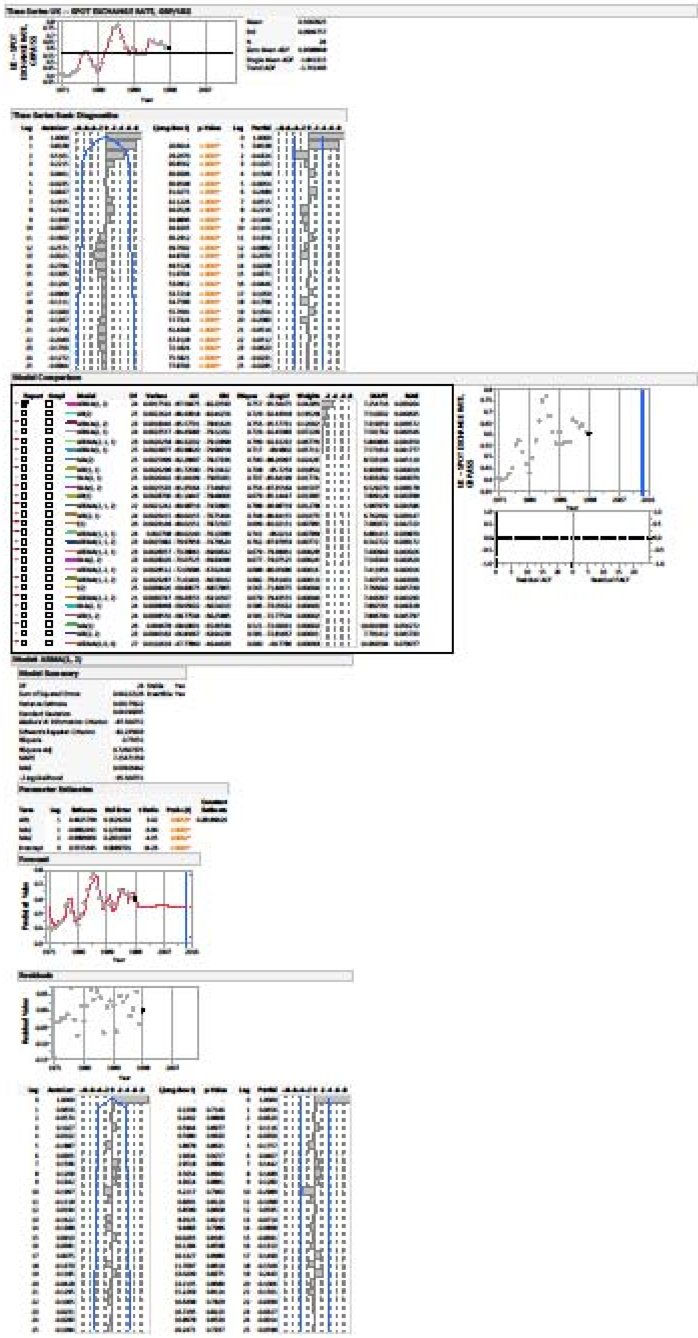


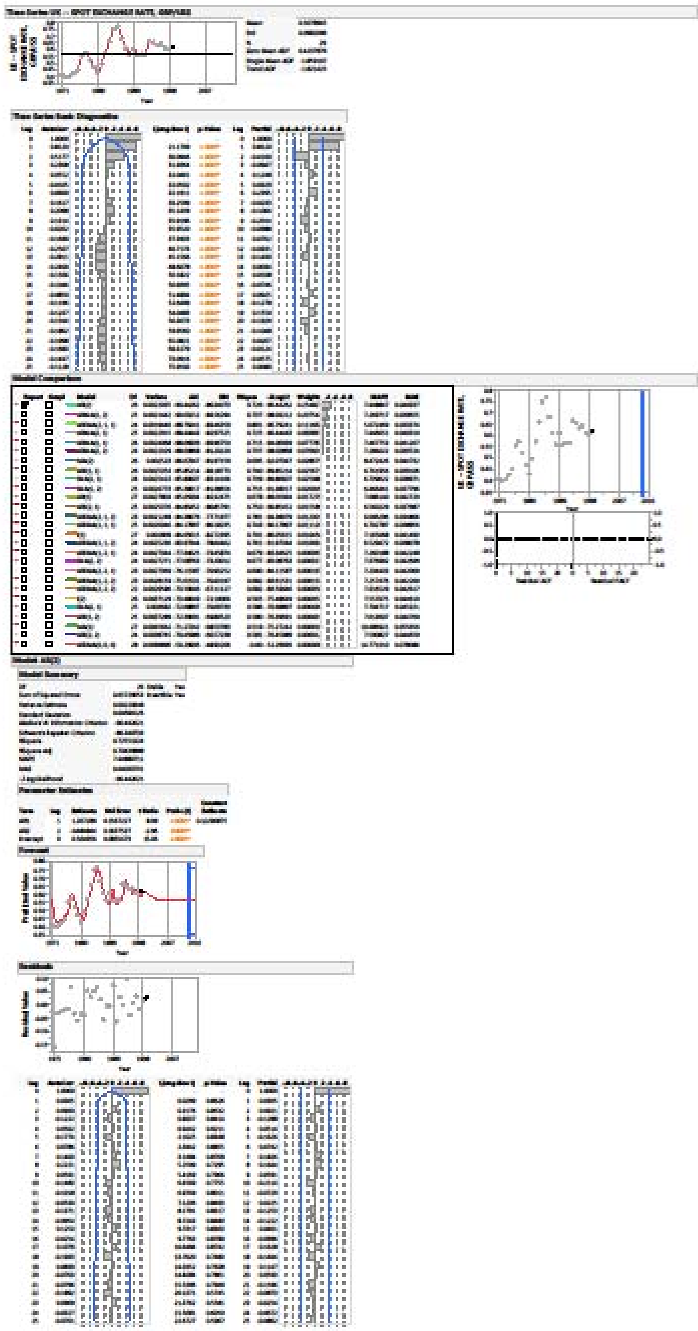


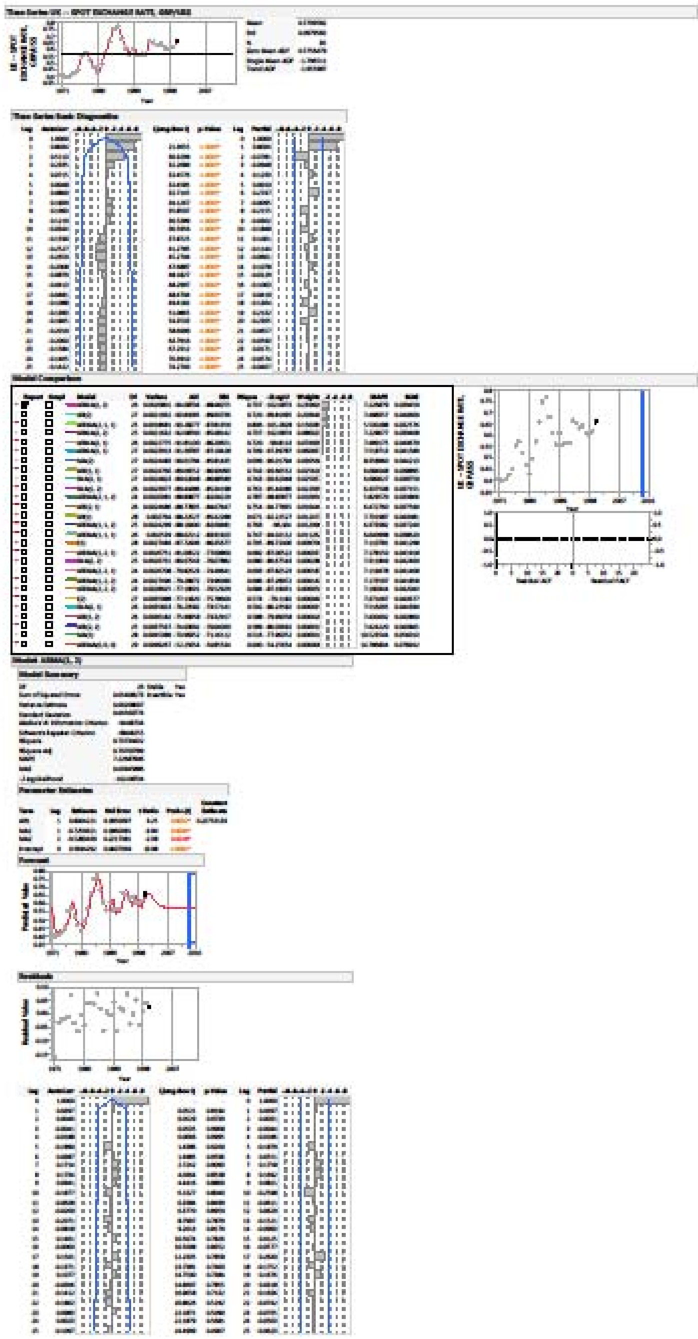


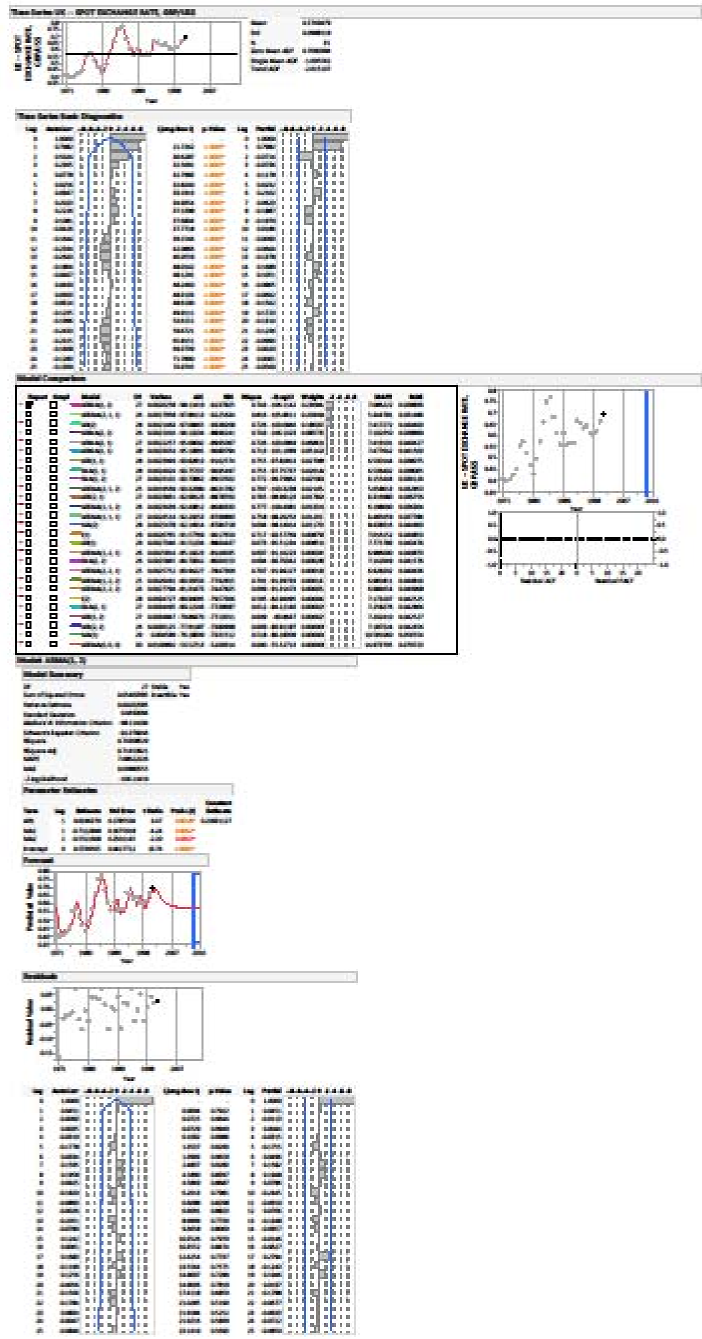


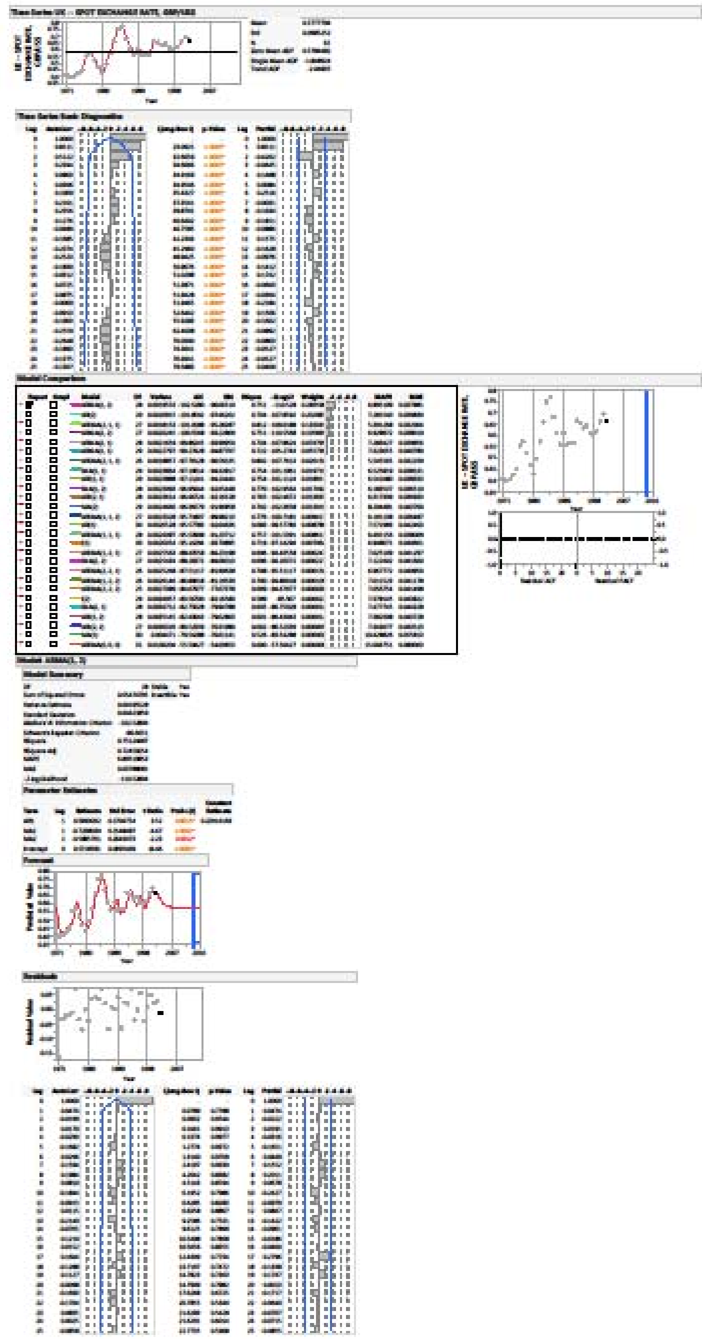


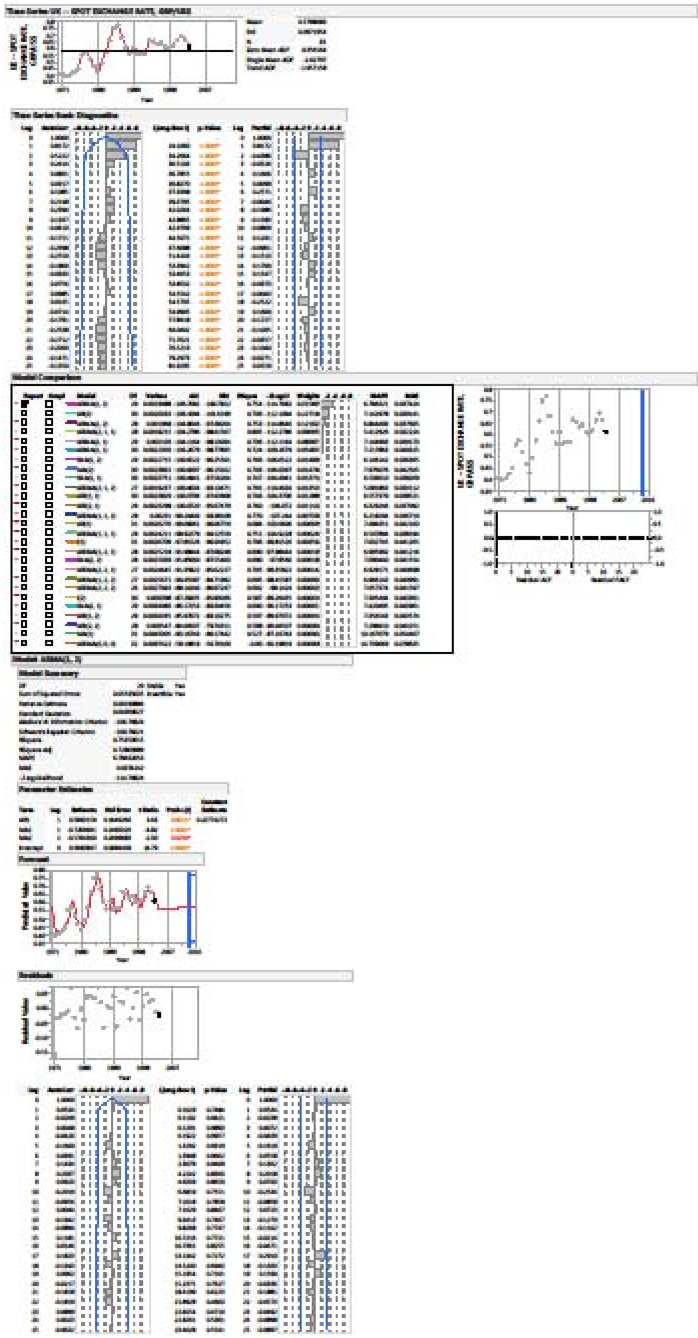


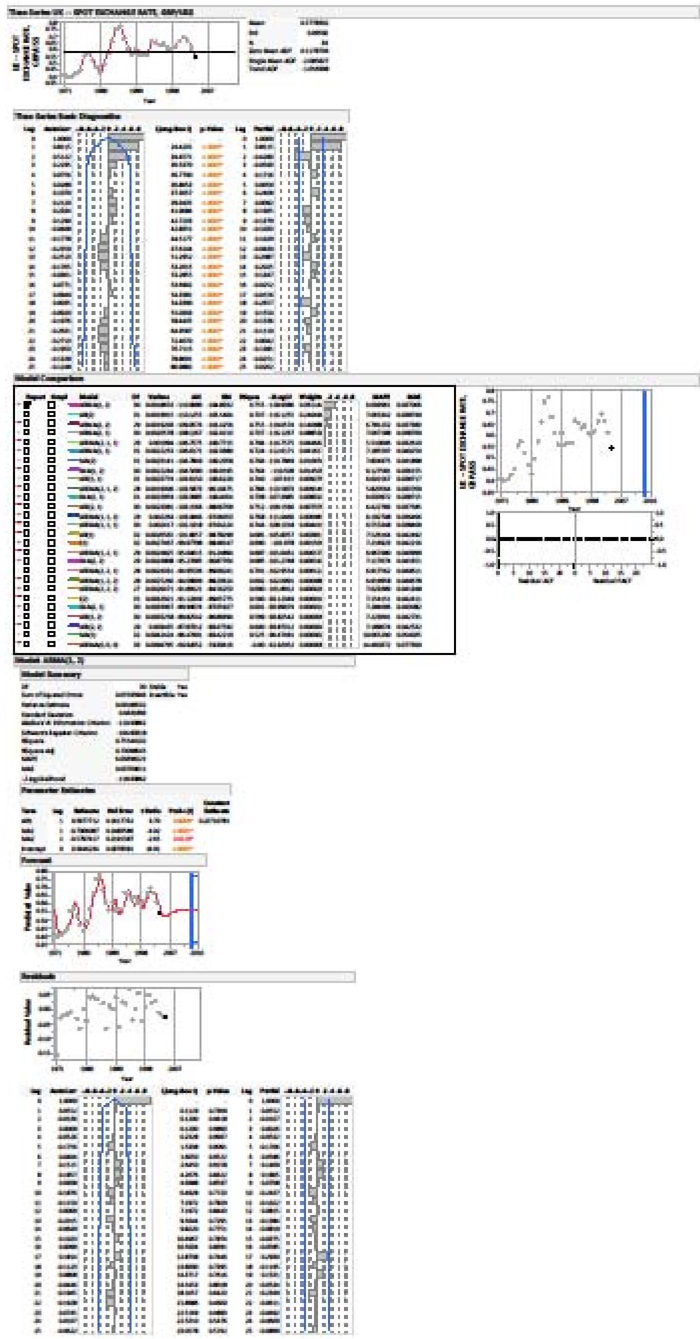


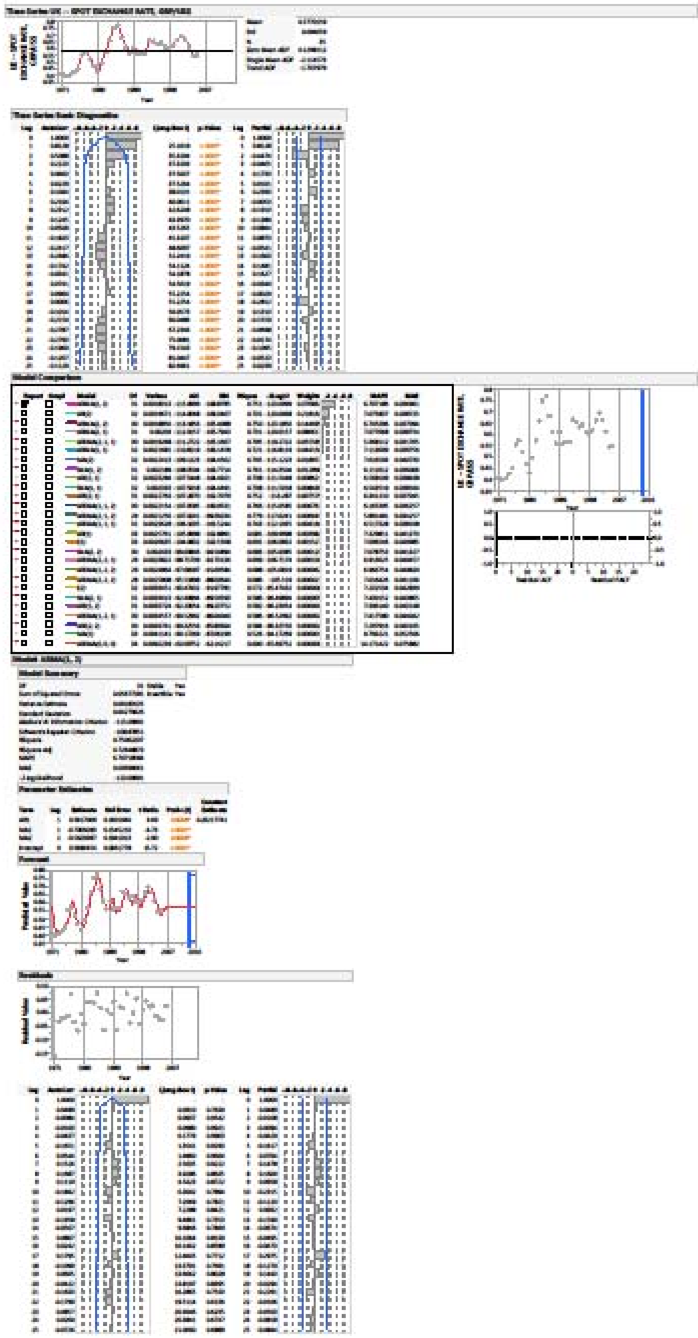


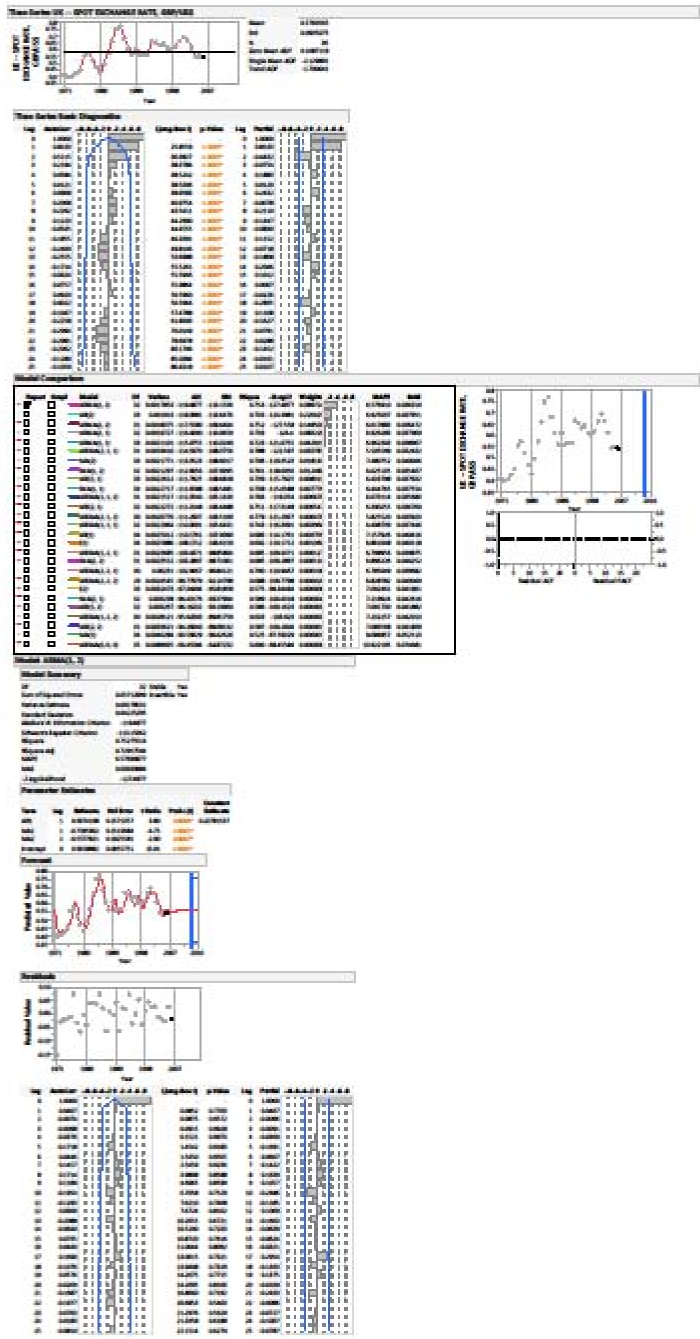


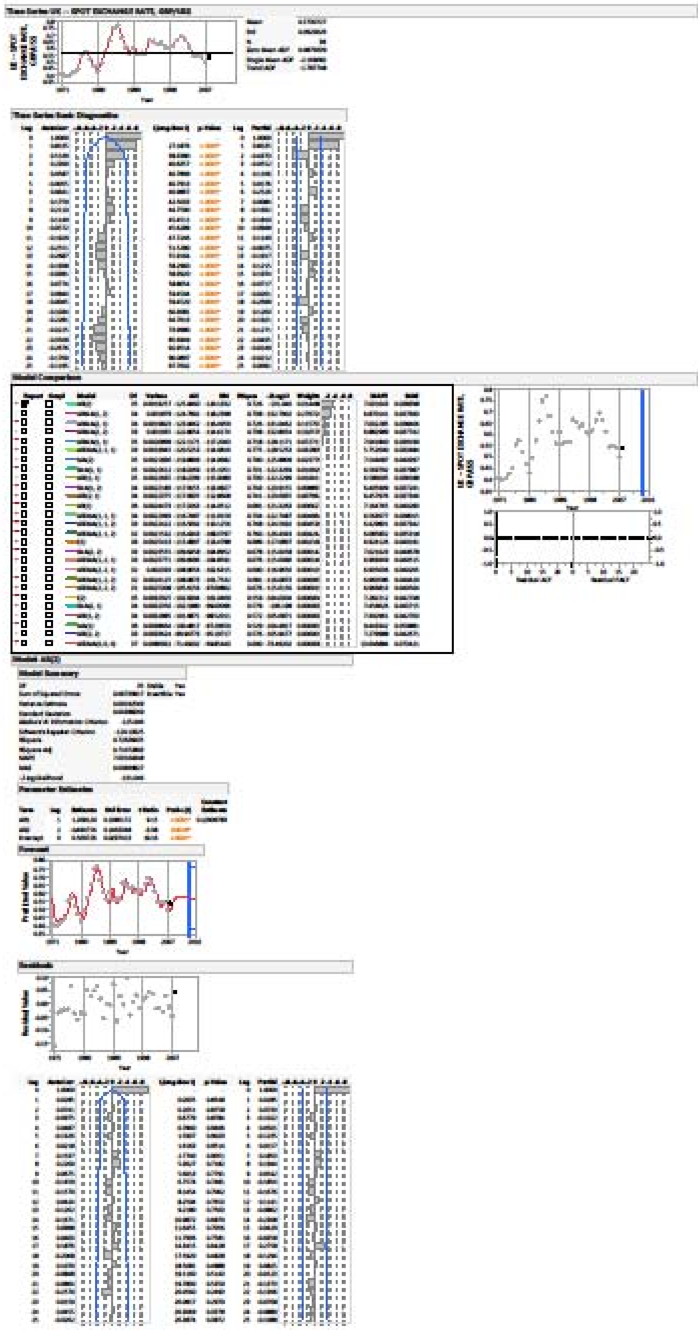


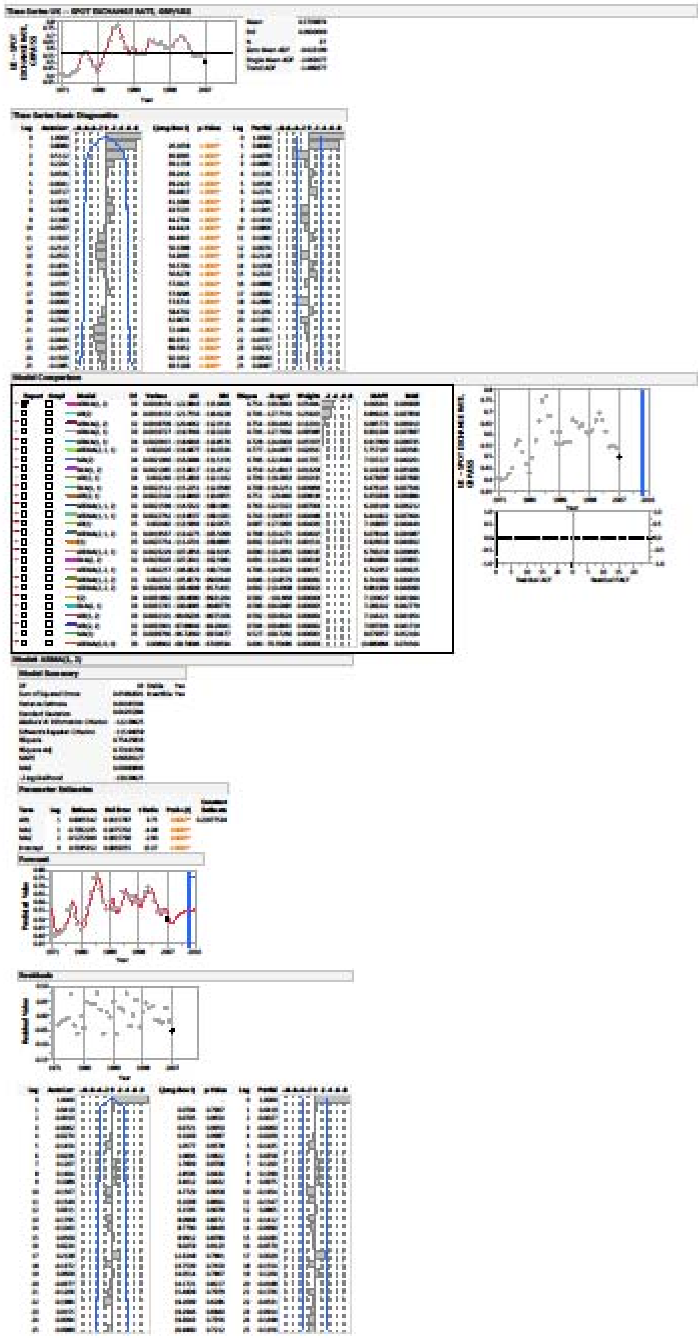


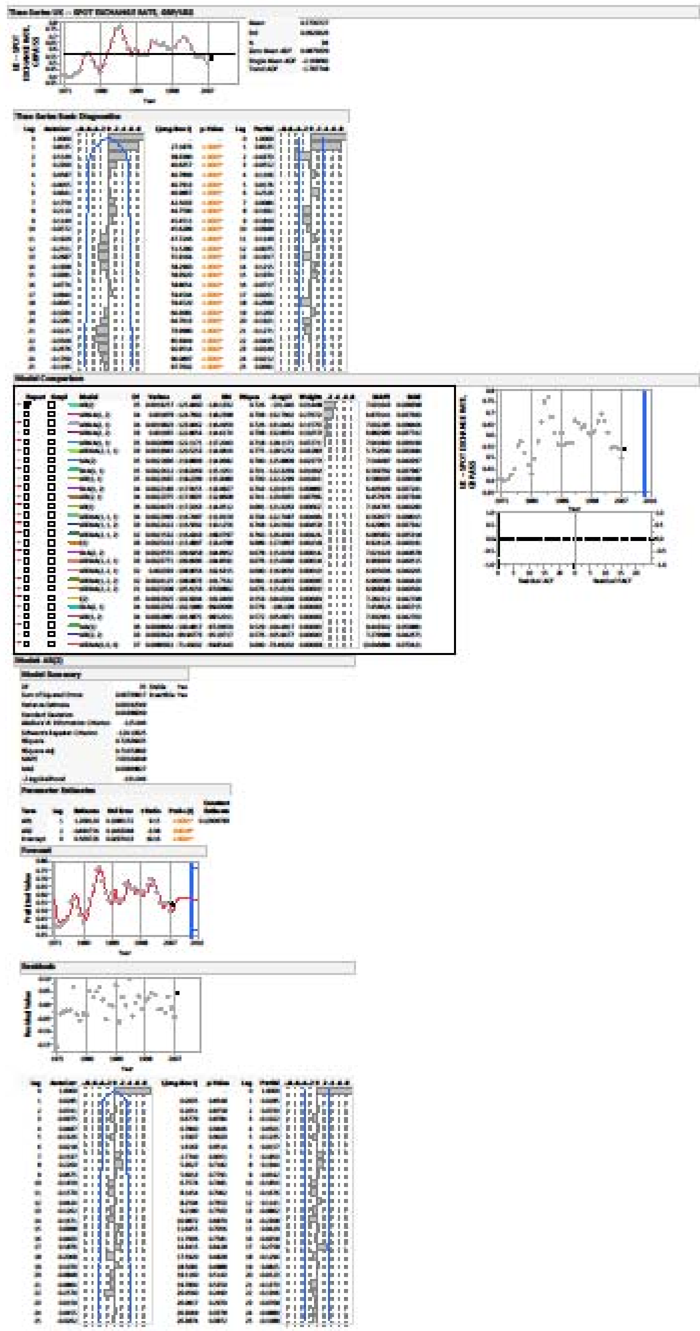


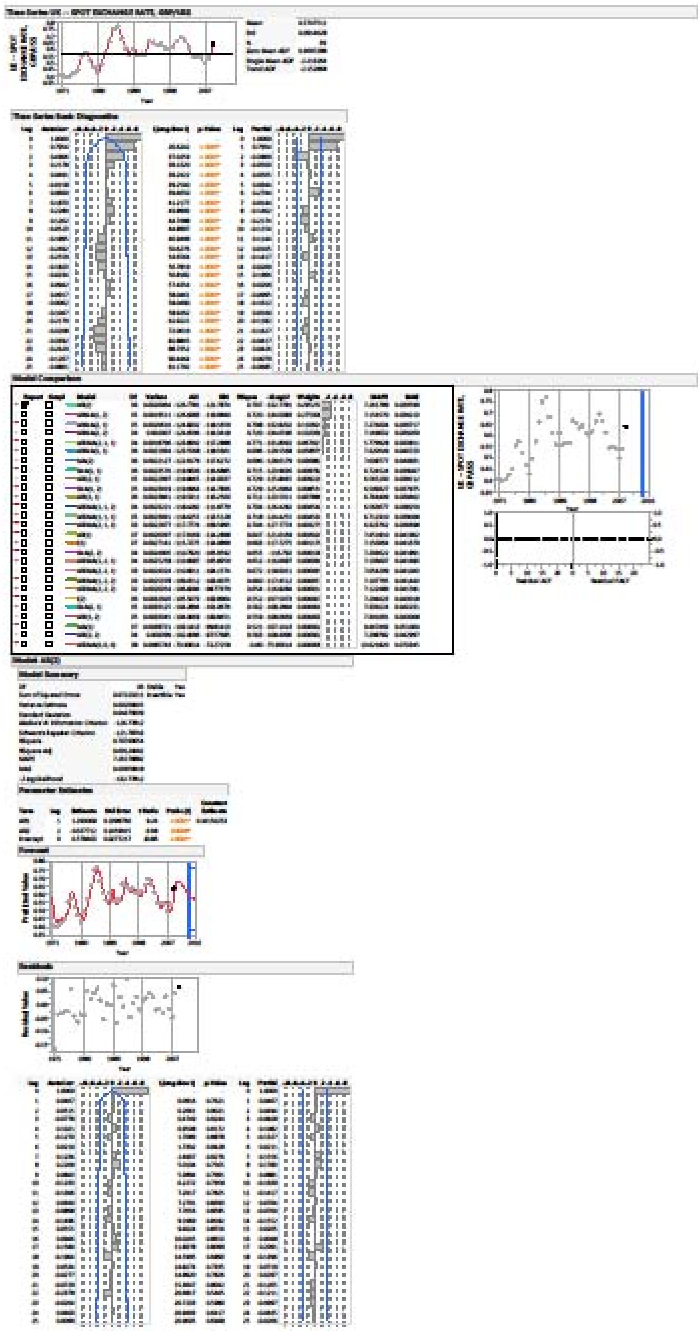


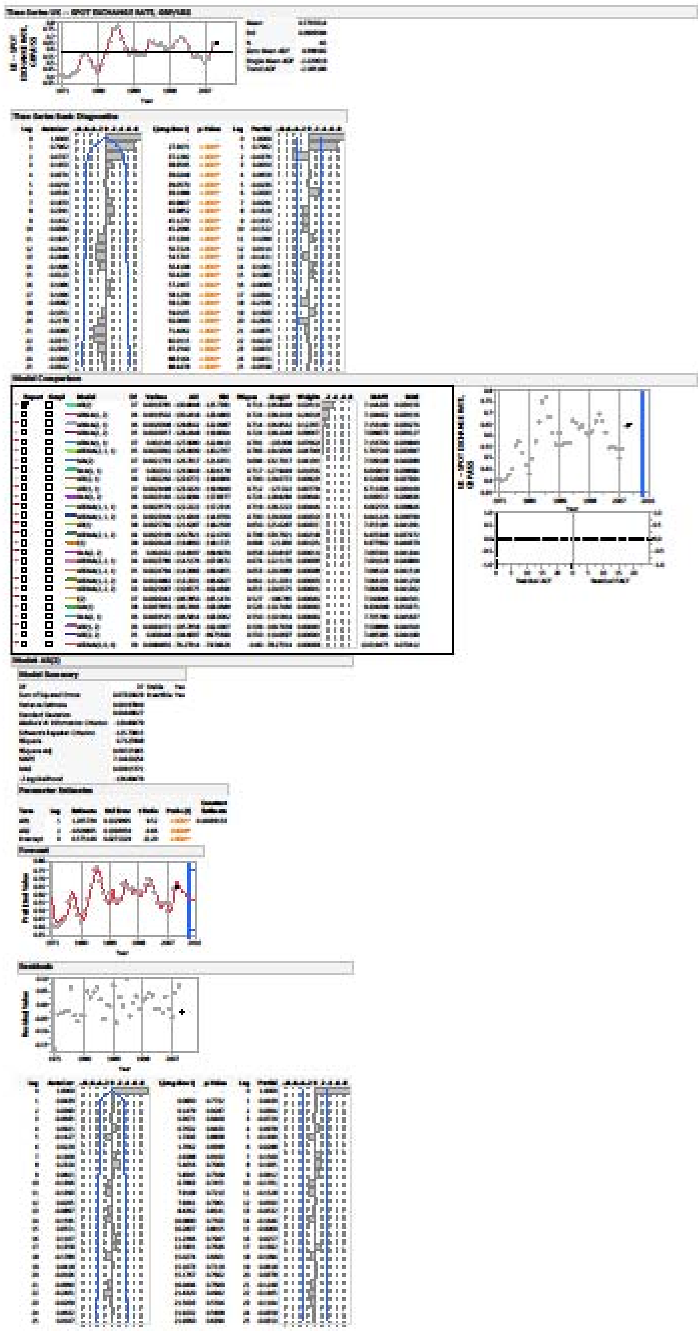












Appendix B: Forward Rate Forecasts

FY06-FY14

Denmark

Subject		Long-term interest rates, Per cent per annum									
Frequency		Monthly									
Time		Dec-2004	Dec-2005	Dec-2006	Dec-2007	Dec-2008	Dec-2009	Dec-2010	Dec-2011	Dec-2012	Dec-2013
Country											
Denmark	i	3.8462	3.3529	3.7766	4.3344	3.4998	3.5295	3.012	1.8571	1.07	1.89
United States	i	4.23	4.47	4.56	4.1	2.42	3.59	3.29	1.98	1.72	2.9
data extracted on 02 Oct 2014 13:05 UTC (GMT) from OECD.Stat											
Annual FRB H.10 Rate		5.9891	5.9953	5.9422	5.4413	5.0885	5.3574	5.6265	5.3535	5.7922	5.617
Calculated Forward Rate		6.463413	7.533895	6.916768	5.202203	3.867432	5.428958	6.016372	5.583784	7.611007	7.580035

European Union

Subject		Long-term interest rates, Per cent per annum									
Frequency		Monthly									
Time		Dec-2004	Dec-2005	Dec-2006	Dec-2007	Dec-2008	Dec-2009	Dec-2010	Dec-2011	Dec-2012	Dec-2013
Country											
United States	i	4.23	4.47	4.56	4.1	2.42	3.59	3.29	1.98	1.72	2.9
Euro area (18 countries)	i	3.6893	3.409	3.9026	4.3818	3.8881	3.8727	4.0714	4.0908	2.0989	3.3128
data extracted on 02 Oct 2014 13:05 UTC (GMT) from OECD.Stat											
Annual FRB H.10 Rate		1.2438	1.2449	1.2563	1.3711	1.4726	1.3935	1.3261	1.3931	1.2859	1.3281
Calculated Forward Rate		0.720868	0.647468	0.701873	0.769641	0.970575	0.761816	0.891444	1.226274	0.885995	0.832653

Japan

Subject		Long-term interest rates, Per cent per annum									
Frequency		Monthly									
Time		Dec-2004	Dec-2005	Dec-2006	Dec-2007	Dec-2008	Dec-2009	Dec-2010	Dec-2011	Dec-2012	Dec-2013
Country											
Japan	i	1.397	1.488	1.645	1.526	1.214	1.272	1.133	0.971	0.781	0.688
United States	i	4.23	4.47	4.56	4.1	2.42	3.59	3.29	1.98	1.72	2.9
data extracted on 02 Oct 2014 13:05 UTC (GMT) from OECD.Stat											
Annual FRB H.10 Rate		108.1508	110.1069	116.3121	117.7623	103.3906	93.6827	87.7817	79.6967	79.818	97.5971
Calculated Forward Rate		235.9736	242.0759	244.4973	237.7624	159.7091	189.2621	176.5511	120.4953	121.9006	225.4909

Norway

Subject		Long-term interest rates, Per cent per annum									
Frequency		Monthly									
Time		Dec-2004	Dec-2005	Dec-2006	Dec-2007	Dec-2008	Dec-2009	Dec-2010	Dec-2011	Dec-2012	Dec-2013
Country											
Norway	i	3.94	3.83	4.24	4.66	3.77	3.98	3.61	2.38	2.08	2.94
United States	i	4.23	4.47	4.56	4.1	2.42	3.59	3.29	1.98	1.72	2.9
data extracted on 02 Oct 2014 13:05 UTC (GMT) from OECD.Stat											
Annual FRB H.10 Rate		6.7399	6.4412	6.4095	5.8557	5.6365	6.2908	6.0451	5.6022	5.8181	5.8772
Calculated Forward Rate		7.135562	7.294692	6.80092	5.276337	4.041264	5.798147	5.625484	4.939218	5.138062	5.817533

South Korea

Subject		Long-term interest rates, Per cent per annum									
Frequency		Monthly									
Time		Dec-2004	Dec-2005	Dec-2006	Dec-2007	Dec-2008	Dec-2009	Dec-2010	Dec-2011	Dec-2012	Dec-2013
Country											
Korea	i	3.85	5.6	4.95	5.82	4.87	5.31	4.46	3.81	3.13	3.653
United States	i	4.23	4.47	4.56	4.1	2.42	3.59	3.29	1.98	1.72	2.9
data extracted on 02 Oct 2014 13:05 UTC (GMT) from OECD.Stat											
Annual FRB H.10 Rate		1145.236	1023.749	954.321	928.9717	1098.706	1274.625	1155.739	1106.94	1126.162	1094.675
Calculated Forward Rate		1234.966	848.4709	891.7689	694.6856	640.132	927.1838	908.0806	685.7965	741.6855	917.5225

United Kingdom

Subject		Long-term interest rates, Per cent per annum									
Frequency		Monthly									
Time		Dec-2004	Dec-2005	Dec-2006	Dec-2007	Dec-2008	Dec-2009	Dec-2010	Dec-2011	Dec-2012	Dec-2013
Country											
United Kingdom	i	4.5316	4.2186	4.6195	4.6937	3.6238	3.8871	3.587	2.1704	1.8361	3.0879
United States	i	4.23	4.47	4.56	4.1	2.42	3.59	3.29	1.98	1.72	2.9
data extracted on 02 Oct 2014 13:05 UTC (GMT) from OECD.Stat											
Annual FRB H.10 Rate		1.833	1.8204	1.8434	2.002	1.8545	1.5661	1.5452	1.6043	1.5853	1.5642
Calculated Forward Rate		0.515808	0.575793	0.536732	0.447416	0.398841	0.599711	0.605263	0.585891	0.604973	0.609919

FY91-FY12

Japan

		Dec-1977	Dec-1978	Dec-1979	Dec-1980	Dec-1981	Dec-1982	Dec-1983	Dec-1984	Dec-1985	Dec-1986	Dec-1987	Dec-1988
Subject													
Unit													
Frequency													
Time		Dec-1977	Dec-1978	Dec-1979	Dec-1980	Dec-1981	Dec-1982	Dec-1983	Dec-1984	Dec-1985	Dec-1986	Dec-1987	Dec-1988
Country													
Japan	i	..	..	..	..	..	..	..	..	..	..	..	..
United States	i	7.69	9.01	10.39	12.84	13.72	10.54	11.83	11.5	9.26	7.11	8.99	9.11
Data extracted on 12 Dec 2014 14:14 UTC (GMT) from OECD.Stat													
Japan FRB H10 Annual Rate		268.6194	210.3854	219.0168	226.6309	220.6281	249.0601	237.5535	237.4622	238.4673	168.3496	144.6023	128.1742
Japan Calculated Forward Rate		#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!

		Dec-1989	Dec-1990	Dec-1991	Dec-1992	Dec-1993	Dec-1994	Dec-1995	Dec-1996	Dec-1997	Dec-1998	Dec-1999	Dec-2000	Dec-2001
Subject														
Unit														
Frequency														
Time		Dec-1989	Dec-1990	Dec-1991	Dec-1992	Dec-1993	Dec-1994	Dec-1995	Dec-1996	Dec-1997	Dec-1998	Dec-1999	Dec-2000	Dec-2001
Country														
Japan	i	5.52	6.454	5.719	4.848	3.396	4.561	2.983	2.597	1.939	1.488	1.767	1.624	1.334
United States	i	7.84	8.08	7.09	6.77	5.77	7.81	5.71	6.3	5.81	4.65	6.28	5.24	5.09
Data extracted on 12 Dec 2014 14:14 UTC (GMT) from OECD.Stat														
Japan FRB H10 Annual Rate		138.0738	144.9987	134.5909	126.7801	111.0755	102.179	93.9649	108.78	121.0581	130.9892	113.7342	107.804	121.568
Japan Calculated Forward Rate		141.1095	147.2134	136.3363	129.1041	113.6258	105.354	96.4531	112.7062	125.6551	135.0704	118.7779	111.6399	126.074

		Dec-2002	Dec-2003	Dec-2004	Dec-2005	Dec-2006	Dec-2007	Dec-2008	Dec-2009	Dec-2010	Dec-2011	Dec-2012	Dec-2013
Subject													
Unit													
Frequency													
Time		Dec-2002	Dec-2003	Dec-2004	Dec-2005	Dec-2006	Dec-2007	Dec-2008	Dec-2009	Dec-2010	Dec-2011	Dec-2012	Dec-2013
Country													
Japan	i	0.975	1.33	1.397	1.488	1.645	1.526	1.214	1.272	1.133	0.971	0.781	0.688
United States	i	4.03	4.27	4.23	4.47	4.56	4.1	2.42	3.59	3.29	1.98	1.72	2.9
Data extracted on 12 Dec 2014 14:14 UTC (GMT) from OECD.Stat													
Japan FRB H10 Annual Rate		125.2204	115.9387	108.1508	110.1069	116.3121	117.7623	103.3906	93.6827	87.7817	79.6967	79.818	97.5971
Japan Calculated Forward Rate		129.0089	119.3026	111.1725	113.3421	119.6477	120.7479	104.6225	95.82699	89.65394	80.49311	80.56168	99.7412

United Kingdom

		Dec-1977	Dec-1978	Dec-1979	Dec-1980	Dec-1981	Dec-1982	Dec-1983	Dec-1984	Dec-1985	Dec-1986	Dec-1987	Dec-1988
Subject													
Unit													
Frequency													
Time		Dec-1977	Dec-1978	Dec-1979	Dec-1980	Dec-1981	Dec-1982	Dec-1983	Dec-1984	Dec-1985	Dec-1986	Dec-1987	Dec-1988
Country													
United Kingdom	i	10.7	13.12	15.02	13.78	16	11.58	10.77	10.87	10.78	10.98	9.63	10.14
United States	i	7.69	9.01	10.39	12.84	13.72	10.54	11.83	11.5	9.26	7.11	8.99	9.11
Data extracted on 12 Dec 2014 14:14 UTC (GMT) from OECD.Stat													
UK FRB H10 Annual Rate		0.573099	0.521268	0.471165	0.430182	0.493998	0.572082	0.659674	0.748055	0.770772	0.681338	0.60983	0.561388
UK Calculated Forward Rate		0.557516	0.502328	0.452199	0.426628	0.484288	0.56675	0.665987	0.752306	0.760197	0.657579	0.60627	0.556138

		Dec-1989	Dec-1990	Dec-1991	Dec-1992	Dec-1993	Dec-1994	Dec-1995	Dec-1996	Dec-1997	Dec-1998	Dec-1999	Dec-2000	Dec-2001
Subject														
Unit														
Frequency														
Time		Dec-1989	Dec-1990	Dec-1991	Dec-1992	Dec-1993	Dec-1994	Dec-1995	Dec-1996	Dec-1997	Dec-1998	Dec-1999	Dec-2000	Dec-2001
Country														
United Kingdom	i	10.56	10.84	9.66	8.32	6.4253	8.5814	7.4926	7.5716	6.3739	4.5175	5.389	4.9118	4.8928
United States	i	7.84	8.08	7.09	6.77	5.77	7.81	5.71	6.3	5.81	4.65	6.28	5.24	5.09
Data extracted on 12 Dec 2014 14:14 UTC (GMT) from OECD.Stat														
UK FRB H10 Annual Rate		0.610426	0.560507	0.565803	0.566155	0.665956	0.652784	0.633513	0.640738	0.61065	0.603391	0.618353	0.659805	0.694637
UK Calculated Forward Rate		0.595408	0.54655	0.552543	0.558054	0.661856	0.648147	0.623007	0.633164	0.607413	0.604156	0.623581	0.661869	0.695943

Subject													
Unit													
Frequency													
Time		Dec-2002	Dec-2003	Dec-2004	Dec-2005	Dec-2006	Dec-2007	Dec-2008	Dec-2009	Dec-2010	Dec-2011	Dec-2012	Dec-2013
Country													
United Kingdom	i	4.5644	4.896	4.5316	4.2186	4.6195	4.6937	3.6238	3.8871	3.587	2.1704	1.8361	3.0879
United States	i	4.03	4.27	4.23	4.47	4.56	4.1	2.42	3.59	3.29	1.98	1.72	2.9

Data extracted on 12 Dec 2014 14:14 UTC (GMT) from OECD.Stat

	Dec-2002	Dec-2003	Dec-2004	Dec-2005	Dec-2006	Dec-2007	Dec-2008	Dec-2009	Dec-2010	Dec-2011	Dec-2012	Dec-2013
UK FRB H10 Annual Rate	0.665557	0.611733	0.545554	0.54933	0.542476	0.4995	0.539229	0.638529	0.647165	0.623325	0.630795	0.639304
UK Calculated Forward Rate	0.662156	0.608082	0.54398	0.550655	0.542167	0.496668	0.532965	0.636703	0.64531	0.622163	0.630076	0.638139

Appendix C: Futures

FY06-FY14

European Union

Average of Euro to USD		
Years	Date	Total
2013	Oct	0.732991705
2012	Oct	0.770624623
2011	Oct	0.728977666
2010	Oct	0.720026364
2009	Oct	0.675165562
2008	Oct	0.754012097
2007	Oct	0.701582711
2006	Oct	0.789643299
2005	Oct	0.828827559
2004	Oct	0.800114072
2003	Oct	0.856002481
2002	Oct	1.021620631
2001	Oct	1.107302109
2000	Oct	1.169556793
1999	Oct	0.929993531
Grand Total		0.835054699

Average of Euro to USD	
Years	Total
2014	0.744733428
2013	0.75277953
2012	0.777854465
2011	0.719483617
2010	0.755444893
2009	0.719262728
2008	0.683924227
2007	0.729647768
2006	0.793435775
2005	0.803080213
2004	0.805704513
2003	0.886499712
2002	1.06336226
2001	1.118317511
2000	1.081889524
1999	0.936301806
Grand Total	0.835942518

Japan

Average of Yen to USD		
Years	Date	Total
2013	Oct	97.78940069
2012	Oct	78.96329455
2011	Oct	76.58292475
2010	Oct	81.76505396
2009	Oct	90.3353353
2008	Oct	99.55121715
2007	Oct	114.9870261
2006	Oct	117.5925598
2005	Oct	114.0557714
2004	Oct	108.4265293
2003	Oct	109.3489943
2002	Oct	123.5326104
2001	Oct	120.9850909
2000	Oct	107.2278872
1999	Oct	104.9935285
Grand Total		103.0803856

Average of Yen to USD	
Years	Total
2014	103.6883616
2013	97.61270849
2012	79.77700579
2011	79.63488988
2010	87.6621709
2009	93.58702798
2008	103.0321677
2007	116.932514
2006	115.3288983
2005	109.5269983
2004	107.897813
2003	115.6952539
2002	124.8138453
2001	120.8111715
2000	106.6763637
1999	112.7846297
Grand Total	104.7229766

United Kingdom

Average of GBP to USD		
Years	Date	Total
2013	Oct	0.621699499
2012	Oct	0.622270698
2011	Oct	0.634591903
2010	Oct	0.630976595
2009	Oct	0.617178349
2008	Oct	0.59378909
2007	Oct	0.489819463
2006	Oct	0.532564132
2005	Oct	0.567164058
2004	Oct	0.555978994
2003	Oct	0.598227276
2002	Oct	0.644377656
2001	Oct	0.691771963
2000	Oct	0.688401391
1999	Oct	0.603163807
Grand Total		0.606070366

Average of GBP to USD	
Years	Total
2014	0.60249054
2013	0.639784535
2012	0.631075791
2011	0.624153433
2010	0.647897072
2009	0.640611169
2008	0.54680069
2007	0.500270964
2006	0.542664332
2005	0.55134956
2004	0.548522976
2003	0.614723026
2002	0.668817186
2001	0.695941312
2000	0.660440922
1999	0.618399451
Grand Total	0.608069322

FY79-FY12

Japan

Annual Average	Forecast
FY	Yen/Dollar
1979	264.0917
1980	207.9966
1981	216.8655
1982	225.4607
1983	217.3627
1984	246.7859
1985	236.2854
1986	235.8201
1987	237.5039
1988	167.769
1989	143.8275
1990	127.425
1991	137.1201
1992	144.6454
1993	134.8046
1994	126.8095
1995	111.0374
1996	101.7484
1997	93.26634
1998	107.8765
1999	119.9822
2000	129.7989
2001	112.7846
2002	106.6764
2003	120.8112
2004	124.8138
2005	115.6953
2006	107.8978
2007	109.527
2008	115.3289
2009	116.9325
2010	103.0322
2011	93.58703
2012	87.66217

October Average FY	Forecast Yen/Dollar
1979	253.29041
1980	181.5734621
1981	227.6081012
1982	208.1839721
1983	228.1281019
1984	269.7545888
1985	231.5982716
1986	244.8924616
1987	214.0548674
1988	156.1110392
1989	142.3666985
1990	127.9531133
1991	141.5974481
1992	129.5548474
1993	130.9372955
1994	121.3797352
1995	106.8821186
1996	97.88388355
1997	99.83112984
1998	111.4926127
1999	120.1484895
2000	119.7346427
2001	104.9935285
2002	107.2278872
2003	120.9850909
2004	123.5326104
2005	109.3489943
2006	108.4265293
2007	114.0557714
2008	117.5925598
2009	114.9870261
2010	99.55121715
2011	90.3353353
2012	81.76505396

United Kingdom

Annual Average	Forecast
FY	Pound/Dollar
1979	0.575878
1980	0.523158
1981	0.473427
1982	0.431988
1983	0.496243
1984	0.572026
1985	0.660256
1986	0.750918
1987	0.782931
1988	0.686305
1989	0.613733
1990	0.564453
1991	0.61611
1992	0.568721
1993	0.572387
1994	0.575308
1995	0.668885
1996	0.653831
1997	0.634083
1998	0.641478
1999	0.611632
2000	0.60512
2001	0.618399
2002	0.660441
2003	0.695941
2004	0.668817
2005	0.614723
2006	0.548523
2007	0.55135
2008	0.542664
2009	0.500271
2010	0.546801
2011	0.640611
2012	0.647897

October Average FY	Forecast Pound/Dollar
1979	0.562642156
1980	0.500231006
1981	0.46668024
1982	0.415380592
1983	0.542111693
1984	0.588763958
1985	0.666970742
1986	0.819272748
1987	0.707101774
1988	0.706091537
1989	0.603199476
1990	0.578881677
1991	0.636935573
1992	0.518308289
1993	0.585820276
1994	0.609991384
1995	0.668184616
1996	0.622679339
1997	0.634363475
1998	0.630774927
1999	0.613698387
2000	0.592527696
2001	0.603163807
2002	0.688401391
2003	0.691771963
2004	0.644377656
2005	0.598227276
2006	0.555978994
2007	0.567164058
2008	0.532564132
2009	0.489819463
2010	0.59378909
2011	0.617178349
2012	0.630976595

Appendix D: Random Walk

FY06-FY14

Denmark

Model: I(1)

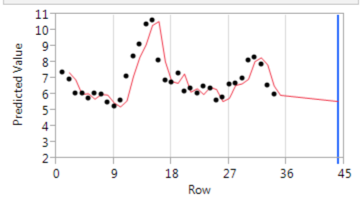
Model Summary

DF	32	Stable	Yes
Sum of Squared Errors	22.2354216	Invertible	Yes
Variance Estimate	0.69485692		
Standard Deviation	0.83358078		
Akaike's 'A' Information Criterion	82.6208509		
Schwarz's Bayesian Criterion	84.1173585		
RSquare	0.59761376		
RSquare Adj	0.59761376		
MAPE	8.89859855		
MAE	0.62958182		
-2LogLikelihood	80.6208509		

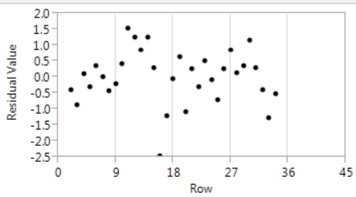
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0429000	0.1423058	-0.30	0.7650	-0.0429

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.3732		5.0281	0.0249*	1	0.3732	
2	-0.0478		5.1134	0.0776	2	-0.2174	
3	-0.1569		6.0612	0.1087	3	-0.0659	
4	-0.0734		6.2758	0.1795	4	0.0138	
5	-0.2617		9.1019	0.1051	5	-0.3271	
6	-0.2556		11.8971	0.0643	6	-0.0624	
7	-0.0986		12.3290	0.0902	7	-0.0283	
8	0.0788		12.6162	0.1258	8	0.0035	
9	-0.0232		12.6421	0.1795	9	-0.1484	
10	-0.2505		15.7935	0.1057	10	-0.3438	
11	-0.1629		17.1868	0.1025	11	-0.0668	
12	-0.0041		17.1877	0.1427	12	-0.1258	
13	0.0605		17.3989	0.1817	13	-0.0706	
14	-0.0743		17.7343	0.2191	14	-0.2595	
15	0.1061		18.4570	0.2394	15	-0.0215	
16	0.2394		22.3506	0.1322	16	-0.0544	
17	0.3237		29.9141	0.0270*	17	0.1328	
18	0.1098		30.8422	0.0300*	18	-0.0155	
19	-0.0101		30.8506	0.0419*	19	-0.0989	
20	-0.0666		31.2451	0.0520	20	-0.0819	
21	-0.1311		32.8999	0.0473*	21	-0.1708	
22	-0.1309		34.6979	0.0417*	22	0.1090	
23	-0.0529		35.0207	0.0518	23	0.0188	
24	-0.0140		35.0459	0.0677	24	-0.1518	
25	-0.0004		35.0459	0.0874	25	-0.0230	

Model: I(1)

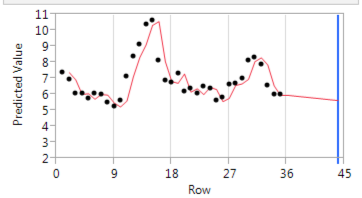
Model Summary

DF	33	Stable	Yes
Sum of Squared Errors	22.2377615	Invertible	Yes
Variance Estimate	0.67387156		
Standard Deviation	0.8208968		
Akaike's 'A' Information Criterion	84.052484		
Schwarz's Bayesian Criterion	85.5788445		
RSquare	0.6033672		
RSquare Adj	0.6033672		
MAPE	8.65957941		
MAE	0.61233893		
-2LogLikelihood	82.052484		

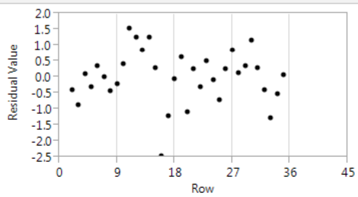
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0414559	0.1388542	-0.30	0.7672	-0.0414559

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3720	5.1319	0.0235*	1	0.3720
2	-0.0507	5.2304	0.0732	2	-0.2195
3	-0.1580	6.2157	0.1016	3	-0.0650
4	-0.0730	6.4333	0.1690	4	0.0134
5	-0.2594	9.2730	0.0987	5	-0.3251
6	-0.2550	12.1153	0.0594	6	-0.0644
7	-0.0984	12.5545	0.0837	7	-0.0291
8	0.0806	12.8601	0.1168	8	0.0056
9	-0.0227	12.8854	0.1679	9	-0.1506
10	-0.2520	16.1240	0.0961	10	-0.3436
11	-0.1630	17.5379	0.0929	11	-0.0664
12	-0.0029	17.5383	0.1304	12	-0.1277
13	0.0600	17.7482	0.1673	13	-0.0732
14	-0.0734	18.0784	0.2032	14	-0.2579
15	0.1038	18.7728	0.2242	15	-0.0281
16	0.2407	22.7125	0.1216	16	-0.0514
17	0.3235	30.2482	0.0246*	17	0.1284
18	0.1071	31.1265	0.0278*	18	-0.0194
19	-0.0156	31.1464	0.0389*	19	-0.1025
20	-0.0663	31.5302	0.0486*	20	-0.0832
21	-0.1286	33.0875	0.0453*	21	-0.1714
22	-0.1291	34.7881	0.0408*	22	0.1024
23	-0.0502	35.0685	0.0512	23	0.0196
24	-0.0107	35.0824	0.0672	24	-0.1545
25	0.0006	35.0824	0.0867	25	-0.0279

Model: I(1)

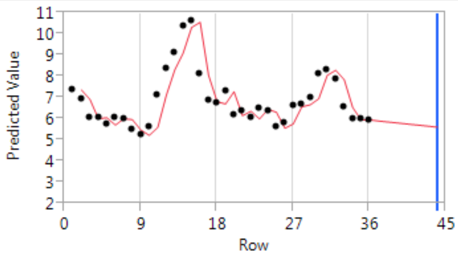
Model Summary

DF	34	Stable	Yes
Sum of Squared Errors	22.2378932	Invertible	Yes
Variance Estimate	0.65405568		
Standard Deviation	0.80873709		
Akaike's 'A' Information Criterion	85.4514359		
Schwarz's Bayesian Criterion	87.0067839		
RSquare	0.60932533		
RSquare Adj	0.60932533		
MAPE	8.41791119		
MAE	0.59520473		
-2LogLikelihood	83.4514359		

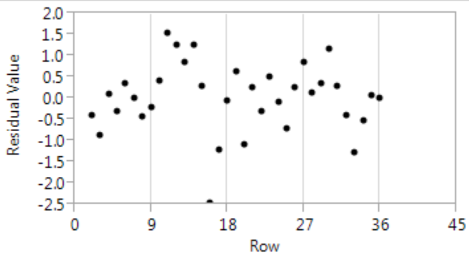
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0417886	0.1346576	-0.31	0.7582	-0.0417886

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3719	5.2693	0.0217*	1	0.3719
2	-0.0504	5.3691	0.0683	2	-0.2191
3	-0.1573	6.3702	0.0949	3	-0.0645
4	-0.0728	6.5914	0.1591	4	0.0132
5	-0.2595	9.4978	0.0908	5	-0.3249
6	-0.2555	12.4139	0.0533	6	-0.0649
7	-0.0986	12.8632	0.0755	7	-0.0286
8	0.0805	13.1743	0.1060	8	0.0058
9	-0.0231	13.2010	0.1537	9	-0.1511
10	-0.2521	16.4940	0.0863	10	-0.3431
11	-0.1627	17.9215	0.0834	11	-0.0665
12	-0.0028	17.9219	0.1181	12	-0.1277
13	0.0597	18.1317	0.1526	13	-0.0726
14	-0.0733	18.4634	0.1865	14	-0.2573
15	0.1037	19.1593	0.2066	15	-0.0285
16	0.2413	23.1266	0.1104	16	-0.0498
17	0.3232	30.6417	0.0221*	17	0.1278
18	0.1072	31.5166	0.0251*	18	-0.0185
19	-0.0150	31.5348	0.0352*	19	-0.1015
20	-0.0649	31.8989	0.0444*	20	-0.0825
21	-0.1287	33.4310	0.0417*	21	-0.1706
22	-0.1297	35.1073	0.0378*	22	0.1025
23	-0.0506	35.3836	0.0476*	23	0.0208
24	-0.0113	35.3986	0.0627	24	-0.1545
25	-0.0002	35.3986	0.0812	25	-0.0275

Model: I(1)

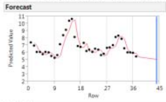
Model Summary

DF	35	Stable	Yes
Sum of Squared Errors	22.4428214	Invertible	Yes
Variance Estimate	0.64122347		
Standard Deviation	0.8007643		
Akaike's 'A' Information Criterion	87.1518415		
Schwarz's Bayesian Criterion	88.7353805		
RSquare	0.61871762		
RSquare Adj	0.61871762		
MAPE	8.41886805		
MAE	0.59221296		
-2LogLikelihood	85.1518415		

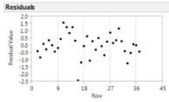
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0545417	0.1316325	-0.41	0.6811	-0.0545417

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3690	5.3222	0.0211*	1	0.3690
2	-0.0502	5.4238	0.0664	2	-0.2158
3	-0.1440	6.2838	0.0986	3	-0.0508
4	-0.0451	6.3706	0.1731	4	0.0329
5	-0.2472	9.0675	0.1064	5	-0.3287
6	-0.2571	12.0809	0.0602	6	-0.0590
7	-0.1192	12.7511	0.0784	7	-0.0452
8	0.0745	13.0220	0.1111	8	0.0233
9	-0.0247	13.0530	0.1602	9	-0.1434
10	-0.2672	16.8102	0.0787	10	-0.3574
11	-0.1673	18.3421	0.0740	11	-0.0364
12	0.0100	18.3477	0.1055	12	-0.1229
13	0.0588	18.5536	0.1376	13	-0.0738
14	-0.0850	19.0025	0.1649	14	-0.2317
15	0.1082	19.7656	0.1811	15	0.0079
16	0.2336	23.4967	0.1011	16	-0.0559
17	0.3421	31.9250	0.0154*	17	0.1855
18	0.0933	32.5873	0.0187*	18	-0.0587
19	-0.0134	32.6017	0.0267*	19	-0.0654
20	-0.0397	32.7363	0.0361*	20	-0.0378
21	-0.0763	33.2672	0.0433*	21	-0.1332
22	-0.1324	34.9801	0.0389*	22	0.1288
23	-0.0738	35.5531	0.0458*	23	-0.0001
24	-0.0269	35.6358	0.0595	24	-0.1175
25	-0.0249	35.7127	0.0761	25	-0.0233

Model: I(1)

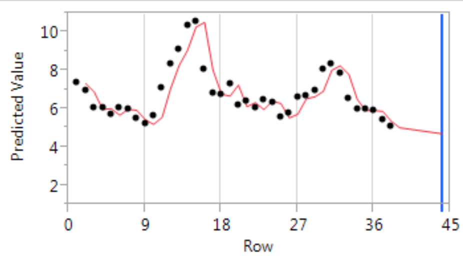
Model Summary

DF	36	Stable	Yes
Sum of Squared Errors	22.5293752	Invertible	Yes
Variance Estimate	0.62581598		
Standard Deviation	0.79108532		
Akaike's 'A' Information Criterion	88.6458295		
Schwarz's Bayesian Criterion	90.2567474		
RSquare	0.63521142		
RSquare Adj	0.63521142		
MAPE	8.35222347		
MAE	0.58492184		
-2LogLikelihood	86.6458295		

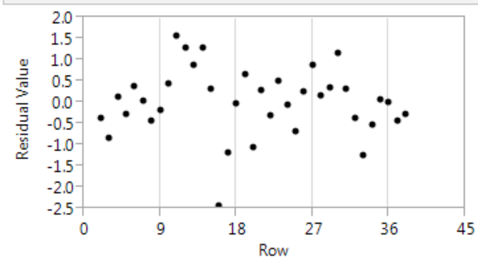
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0626027	0.1282829	-0.49	0.6285	-0.0626027

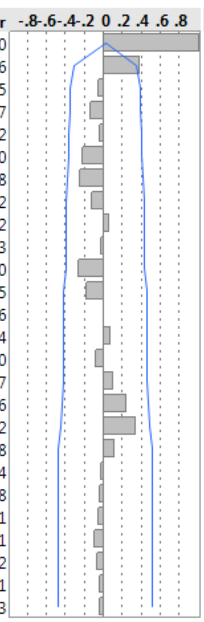
Forecast



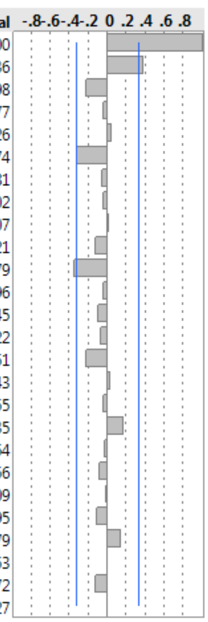
Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value
0	1.0000	.	.
1	0.3736	5.5959	0.0180*
2	-0.0495	5.6968	0.0579
3	-0.1437	6.5734	0.0868
4	-0.0372	6.6339	0.1565
5	-0.2290	8.9977	0.1092
6	-0.2498	11.9012	0.0642
7	-0.1212	12.6073	0.0823
8	0.0602	12.7878	0.1194
9	-0.0283	12.8292	0.1705
10	-0.2680	16.6682	0.0820
11	-0.1785	18.4358	0.0720
12	0.0056	18.4376	0.1030
13	0.0664	18.7024	0.1326
14	-0.0850	19.1559	0.1591
15	0.1007	19.8206	0.1789
16	0.2366	23.6656	0.0971
17	0.3372	31.8675	0.0156*
18	0.1068	32.7338	0.0180*
19	-0.0214	32.7706	0.0255*
20	-0.0388	32.8985	0.0346*
21	-0.0601	33.2240	0.0438*
22	-0.0991	34.1689	0.0472*
23	-0.0762	34.7672	0.0548
24	-0.0421	34.9638	0.0689
25	-0.0353	35.1134	0.0862



Lag	Partial
0	1.0000
1	0.3736
2	-0.2198
3	-0.0477
4	0.0426
5	-0.3174
6	-0.0581
7	-0.0402
8	0.0107
9	-0.1321
10	-0.3479
11	-0.0396
12	-0.1045
13	-0.0722
14	-0.2251
15	0.0343
16	-0.0355
17	0.1735
18	-0.0254
19	-0.0856
20	-0.0109
21	-0.1095
22	0.1379
23	0.0053
24	-0.1272
25	0.0027



Model: I(1)

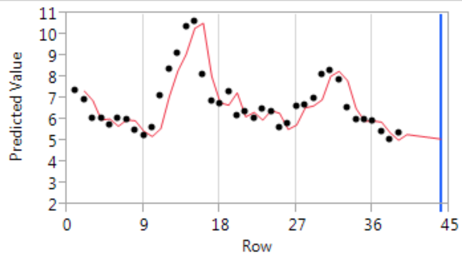
Model Summary

DF	37	Stable	Yes
Sum of Squared Errors	22.6363773	Invertible	Yes
Variance Estimate	0.61179398		
Standard Deviation	0.7821726		
Akaike's 'A' Information Criterion	90.154267		
Schwarz's Bayesian Criterion	91.7918532		
RSquare	0.64462524		
RSquare Adj	0.64462524		
MAPE	8.28836991		
MAE	0.57733463		
-2LogLikelihood	88.154267		

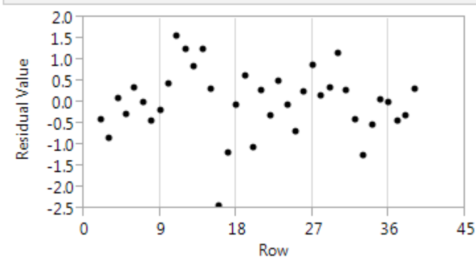
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0538789	0.1253131	-0.43	0.6697	-0.0538789

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3675	5.5473	0.0185*	1	0.3675
2	-0.0562	5.6809	0.0584	2	-0.2211
3	-0.1436	6.5768	0.0867	3	-0.0451
4	-0.0368	6.6375	0.1563	4	0.0383
5	-0.2362	9.2081	0.1010	5	-0.3237
6	-0.2677	12.6118	0.0496*	6	-0.0781
7	-0.1277	13.4117	0.0627	7	-0.0400
8	0.0626	13.6102	0.0925	8	0.0066
9	-0.0125	13.6184	0.1366	9	-0.1190
10	-0.2620	17.3459	0.0671	10	-0.3597
11	-0.1751	19.0723	0.0598	11	-0.0578
12	0.0189	19.0933	0.0863	12	-0.0956
13	0.0713	19.4027	0.1111	13	-0.0951
14	-0.0931	19.9520	0.1317	14	-0.2357
15	0.0996	20.6080	0.1498	15	0.0235
16	0.2429	24.6832	0.0756	16	-0.0586
17	0.3312	32.6246	0.0126*	17	0.1529
18	0.1106	33.5541	0.0143*	18	-0.0100
19	-0.0370	33.6638	0.0201*	19	-0.1244
20	-0.0296	33.7378	0.0280*	20	0.0142
21	-0.0607	34.0671	0.0356*	21	-0.1306
22	-0.1161	35.3467	0.0356*	22	0.1066
23	-0.1121	36.6205	0.0356*	23	-0.0006
24	-0.0392	36.7870	0.0459*	24	-0.1366
25	-0.0181	36.8252	0.0600	25	0.0112

Model: I(1)

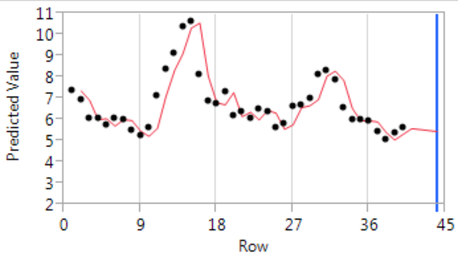
Model Summary

DF	38	Stable	Yes
Sum of Squared Errors	22.7380179	Invertible	Yes
Variance Estimate	0.59836889		
Standard Deviation	0.77354308		
Akaike's 'A' Information Criterion	91.6357959		
Schwarz's Bayesian Criterion	93.2993576		
RSquare	0.64956615		
RSquare Adj	0.64956615		
MAPE	8.21935947		
MAE	0.5701357		
-2LogLikelihood	89.6357959		

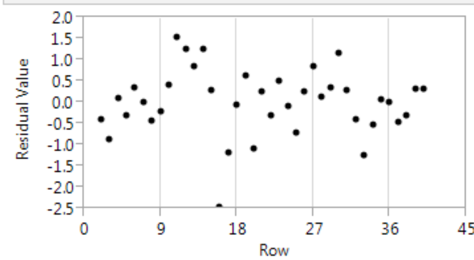
Parameter Estimates

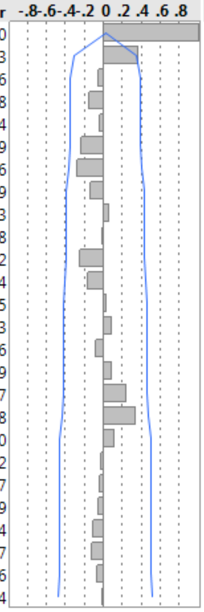
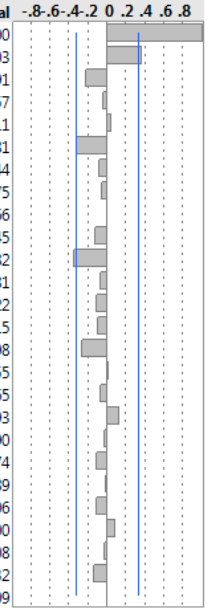
Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0455974	0.1220747	-0.37	0.7108	-0.0455974

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.3703		5.7688	0.0163*	1	0.3703	
2	-0.0606		5.9275	0.0516	2	-0.2291	
3	-0.1498		6.9236	0.0744	3	-0.0457	
4	-0.0374		6.9873	0.1366	4	0.0411	
5	-0.2349		9.5823	0.0880	5	-0.3281	
6	-0.2746		13.2367	0.0394*	6	-0.0844	
7	-0.1459		14.2999	0.0461*	7	-0.0575	
8	0.0553		14.4577	0.0706	8	0.0066	
9	-0.0098		14.4628	0.1068	9	-0.1245	
10	-0.2452		17.7767	0.0588	10	-0.3482	
11	-0.1694		19.4148	0.0540	11	-0.0681	
12	0.0215		19.4422	0.0784	12	-0.1122	
13	0.0843		19.8796	0.0983	13	-0.0915	
14	-0.0876		20.3706	0.1189	14	-0.2598	
15	0.0899		20.9090	0.1398	15	0.0155	
16	0.2407		24.9366	0.0710	16	-0.0665	
17	0.3368		33.1832	0.0107*	17	0.1293	
18	0.1060		34.0389	0.0125*	18	-0.0290	
19	-0.0332		34.1271	0.0178*	19	-0.1074	
20	-0.0447		34.2955	0.0242*	20	-0.0189	
21	-0.0519		34.5347	0.0317*	21	-0.1106	
22	-0.1164		35.8080	0.0318*	22	0.0800	
23	-0.1287		37.4629	0.0291*	23	-0.0308	
24	-0.0746		38.0558	0.0342*	24	-0.1432	
25	-0.0154		38.0828	0.0454*	25	-0.0009	

Model: I(1)

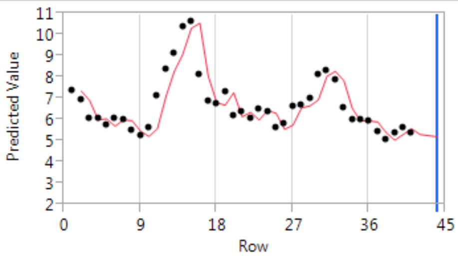
Model Summary

DF	39	Stable	Yes
Sum of Squared Errors	22.788437	Invertible	Yes
Variance Estimate	0.5843189		
Standard Deviation	0.76440755		
Akaike's 'A' Information Criterion	93.0100349		
Schwarz's Bayesian Criterion	94.6989143		
RSquare	0.65813676		
RSquare Adj	0.65813676		
MAPE	8.11942435		
MAE	0.56185162		
-2LogLikelihood	91.0100349		

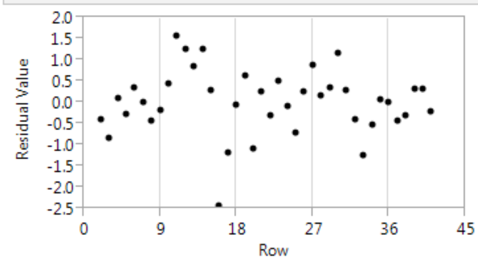
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0512825	0.1191494	-0.43	0.6693	-0.0512825

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3664	5.7832	0.0162*	1	0.3664
2	-0.0634	5.9606	0.0508	2	-0.2282
3	-0.1462	6.9315	0.0741	3	-0.0415
4	-0.0324	6.9806	0.1369	4	0.0414
5	-0.2340	9.6088	0.0871	5	-0.3277
6	-0.2742	13.3246	0.0382*	6	-0.0839
7	-0.1397	14.3186	0.0458*	7	-0.0520
8	0.0684	14.5641	0.0682	8	0.0194
9	-0.0050	14.5654	0.1036	9	-0.1245
10	-0.2469	17.9797	0.0553	10	-0.3433
11	-0.1803	19.8640	0.0472*	11	-0.0792
12	0.0178	19.8829	0.0693	12	-0.1000
13	0.0820	20.3012	0.0880	13	-0.0793
14	-0.0968	20.9070	0.1040	14	-0.2622
15	0.0868	21.4128	0.1241	15	0.0332
16	0.2470	25.6837	0.0586	16	-0.0580
17	0.3369	33.9737	0.0085*	17	0.1329
18	0.1007	34.7473	0.0102*	18	-0.0171
19	-0.0300	34.8192	0.0147*	19	-0.0959
20	-0.0473	35.0068	0.0201*	20	-0.0311
21	-0.0410	35.1550	0.0271*	21	-0.0813
22	-0.1222	36.5488	0.0265*	22	0.0614
23	-0.1278	38.1628	0.0245*	23	-0.0137
24	-0.0622	38.5694	0.0303*	24	-0.1215
25	0.0096	38.5797	0.0406*	25	0.0062

Model: I(1)

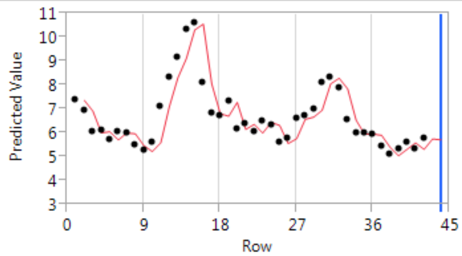
Model Summary

DF	40	Stable	Yes
Sum of Squared Errors	23.0226642	Invertible	Yes
Variance Estimate	0.57556661		
Standard Deviation	0.75866106		
Akaike's 'A' Information Criterion	94.6921494		
Schwarz's Bayesian Criterion	96.4057214		
RSquare	0.65846343		
RSquare Adj	0.65846343		
MAPE	8.1254412		
MAE	0.55931053		
-2LogLikelihood	92.6921494		

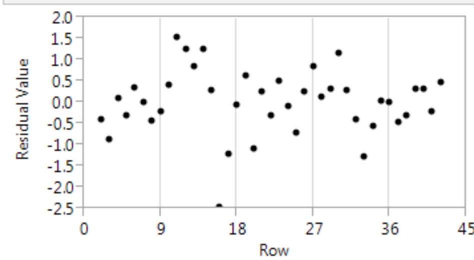
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0393317	0.1173223	-0.34	0.7392	-0.0393317

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3577	5.6407	0.0175*	1	0.3577
2	-0.0567	5.7859	0.0554	2	-0.2118
3	-0.1385	6.6758	0.0830	3	-0.0458
4	-0.0391	6.7486	0.1498	4	0.0302
5	-0.2417	9.6101	0.0871	5	-0.3191
6	-0.2723	13.3437	0.0379*	6	-0.0911
7	-0.1381	14.3326	0.0456*	7	-0.0559
8	0.0552	14.4952	0.0697	8	0.0093
9	-0.0328	14.5546	0.1039	9	-0.1478
10	-0.2538	18.2185	0.0514	10	-0.3386
11	-0.1729	19.9763	0.0457*	11	-0.1052
12	0.0422	20.0846	0.0655	12	-0.0784
13	0.0896	20.5904	0.0814	13	-0.0963
14	-0.0912	21.1331	0.0983	14	-0.2855
15	0.1046	21.8745	0.1111	15	0.0220
16	0.2501	26.2839	0.0502	16	-0.0871
17	0.3188	33.7478	0.0090*	17	0.1209
18	0.0982	34.4871	0.0110*	18	-0.0127
19	-0.0194	34.5172	0.0160*	19	-0.1177
20	-0.0534	34.7570	0.0214*	20	-0.0694
21	-0.0352	34.8661	0.0292*	21	-0.0497
22	-0.1438	36.7860	0.0250*	22	0.0030
23	-0.1136	38.0494	0.0252*	23	0.0294
24	-0.0633	38.4653	0.0310*	24	-0.1541
25	-0.0164	38.4950	0.0414*	25	-0.0568

European Union

Model: I(1)

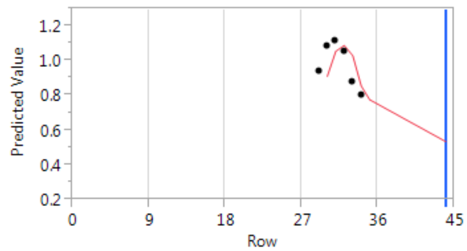
Model Summary

DF	4	Stable	Yes
Sum of Squared Errors	0.0586345	Invertible	Yes
Variance Estimate	0.01465863		
Standard Deviation	0.12107281		
Akaike's 'A' Information Criterion	-6.0399639		
Schwarz's Bayesian Criterion	-6.430526		
RSquare	0.22234563		
RSquare Adj	0.22234563		
MAPE	9.50903853		
MAE	0.09290083		
-2LogLikelihood	-8.0399639		

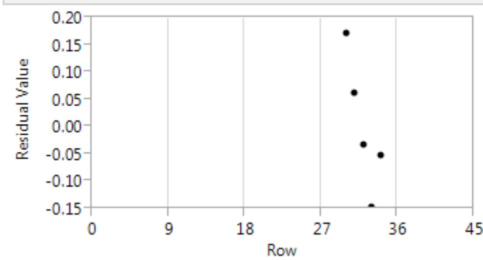
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0269430	0.0484296	-0.56	0.6076	-0.026943

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3575	1.1180	0.2903	1	0.3575
2	-0.2187	1.6762	0.4325	2	-0.3973
3	-0.4856	5.8023	0.1216	3	-0.3190
4	-0.1532	6.6233	0.1572	4	0.1361
5	0.0000	.	.	5	-0.2557
6	0.0000	.	.	6	-0.1761
7	0.0000	.	.	7	0.0689
8	0.0000	.	.	8	-0.1918
9	0.0000	.	.	9	-0.1067
10	0.0000	.	.	10	0.0299
11	0.0000	.	.	11	-0.1492
12	0.0000	.	.	12	-0.0694
13	0.0000	.	.	13	0.0056
14	0.0000	.	.	14	-0.1179
15	0.0000	.	.	15	-0.0482
16	0.0000	.	.	16	-0.0099
17	0.0000	.	.	17	-0.0939
18	0.0000	.	.	18	-0.0361
19	0.0000	.	.	19	-0.0194
20	0.0000	.	.	20	-0.0755
21	0.0000	.	.	21	-0.0292
22	0.0000	.	.	22	-0.0248
23	0.0000	.	.	23	-0.0612
24	0.0000	.	.	24	-0.0254
25	0.0000	.	.	25	-0.0275

Model: I(1)

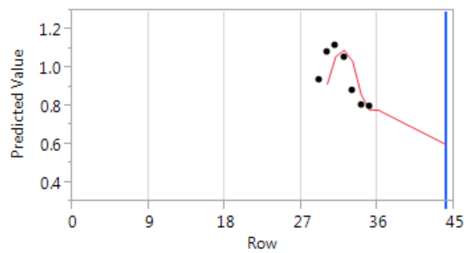
Model Summary

DF	5	Stable	Yes
Sum of Squared Errors	0.05920796	Invertible	Yes
Variance Estimate	0.01184159		
Standard Deviation	0.10881908		
Akaike's 'A' Information Criterion	-8.68349		
Schwarz's Bayesian Criterion	-8.8917305		
RSquare	0.43158162		
RSquare Adj	0.43158162		
MAPE	8.4872811		
MAE	0.08178945		
-2LogLikelihood	-10.68349		

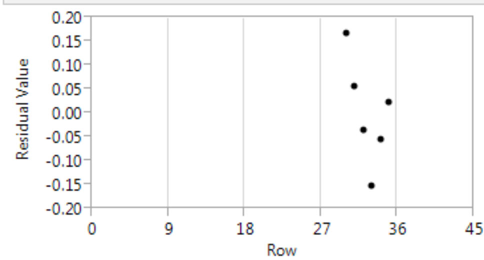
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0225709	0.0405518	-0.56	0.6018	-0.0225709

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.3431		1.1302	0.2877	1	0.3431	
2	-0.2693		2.0006	0.3678	2	-0.4387	
3	-0.4962		5.9397	0.1146	3	-0.2985	
4	-0.1393		6.4054	0.1708	4	0.0996	
5	0.0617		6.5880	0.2531	5	-0.2150	
6	0.0000		.	.	6	-0.2330	
7	0.0000		.	.	7	0.0888	
8	0.0000		.	.	8	-0.1684	
9	0.0000		.	.	9	-0.1632	
10	0.0000		.	.	10	0.0588	
11	0.0000		.	.	11	-0.1273	
12	0.0000		.	.	12	-0.1299	
13	0.0000		.	.	13	0.0449	
14	0.0000		.	.	14	-0.1041	
15	0.0000		.	.	15	-0.1051	
16	0.0000		.	.	16	0.0332	
17	0.0000		.	.	17	-0.0867	
18	0.0000		.	.	18	-0.0877	
19	0.0000		.	.	19	0.0247	
20	0.0000		.	.	20	-0.0739	
21	0.0000		.	.	21	-0.0744	
22	0.0000		.	.	22	0.0179	
23	0.0000		.	.	23	-0.0638	
24	0.0000		.	.	24	-0.0640	
25	0.0000		.	.	25	0.0125	

Model: I(1)

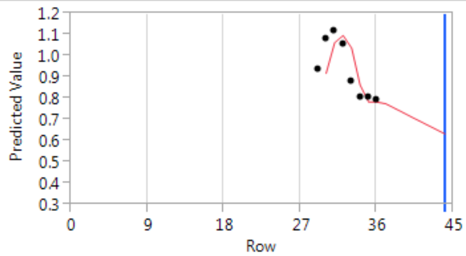
Model Summary

DF	6	Stable	Yes
Sum of Squared Errors	0.05940813	Invertible	Yes
Variance Estimate	0.00990136		
Standard Deviation	0.09950555		
Akaike's 'A' Information Criterion	-11.519501		
Schwarz's Bayesian Criterion	-11.573591		
RSquare	0.53106782		
RSquare Adj	0.53106782		
MAPE	7.51794169		
MAE	0.07197648		
-2LogLikelihood	-13.519501		

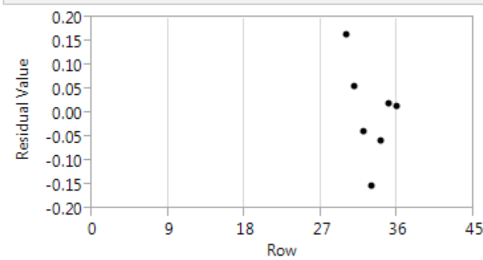
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0203878	0.0348199	-0.59	0.5795	-0.0203878

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3536	1.3132	0.2518	1	0.3536
2	-0.2742	2.2602	0.3230	2	-0.4563
3	-0.5282	6.6549	0.0837	3	-0.3258
4	-0.1542	7.1541	0.1280	4	0.1218
5	0.0666	7.2938	0.1997	5	-0.2447
6	0.0364	7.3770	0.2874	6	-0.2213
7	0.0000	.	.	7	0.0708
8	0.0000	.	.	8	-0.1586
9	0.0000	.	.	9	-0.1679
10	0.0000	.	.	10	0.0435
11	0.0000	.	.	11	-0.1126
12	0.0000	.	.	12	-0.1328
13	0.0000	.	.	13	0.0246
14	0.0000	.	.	14	-0.0838
15	0.0000	.	.	15	-0.1082
16	0.0000	.	.	16	0.0112
17	0.0000	.	.	17	-0.0647
18	0.0000	.	.	18	-0.0897
19	0.0000	.	.	19	0.0016
20	0.0000	.	.	20	-0.0515
21	0.0000	.	.	21	-0.0753
22	0.0000	.	.	22	-0.0053
23	0.0000	.	.	23	-0.0423
24	0.0000	.	.	24	-0.0638
25	0.0000	.	.	25	-0.0102

Model: I(1)

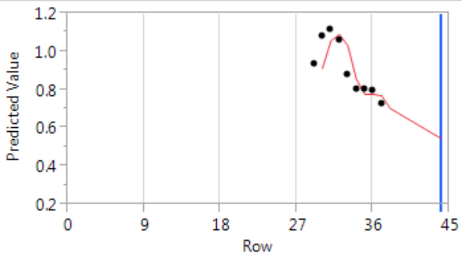
Model Summary

DF	7	Stable	Yes
Sum of Squared Errors	0.06128054	Invertible	Yes
Variance Estimate	0.00875436		
Standard Deviation	0.09356475		
Akaike's 'A' Information Criterion	-14.270859		
Schwarz's Bayesian Criterion	-14.191418		
RSquare	0.62559614		
RSquare Adj	0.62559614		
MAPE	7.34407503		
MAE	0.0687618		
-2LogLikelihood	-16.270859		

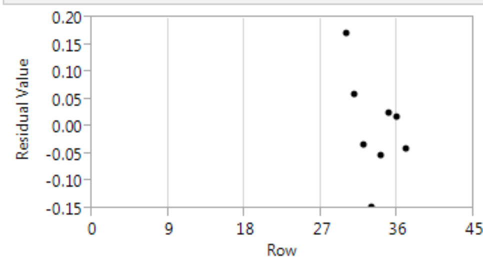
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0261702	0.0309426	-0.85	0.4256	-0.0261702

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3168	1.1473	0.2841	1	0.3168
2	-0.3036	2.3766	0.3047	2	-0.4491
3	-0.4893	6.2078	0.1019	3	-0.2891
4	-0.0354	6.2328	0.1824	4	0.1843
5	0.1113	6.5632	0.2552	5	-0.2612
6	0.0129	6.5698	0.3625	6	-0.1392
7	-0.1127	7.5863	0.3705	7	-0.0032
8	0.0000	.	.	8	-0.0522
9	0.0000	.	.	9	-0.2047
10	0.0000	.	.	10	0.0001
11	0.0000	.	.	11	0.0055
12	0.0000	.	.	12	-0.2012
13	0.0000	.	.	13	0.0096
14	0.0000	.	.	14	-0.0022
15	0.0000	.	.	15	-0.1408
16	0.0000	.	.	16	-0.0334
17	0.0000	.	.	17	0.0167
18	0.0000	.	.	18	-0.1016
19	0.0000	.	.	19	-0.0663
20	0.0000	.	.	20	0.0341
21	0.0000	.	.	21	-0.0809
22	0.0000	.	.	22	-0.0740
23	0.0000	.	.	23	0.0286
24	0.0000	.	.	24	-0.0549
25	0.0000	.	.	25	-0.0771

Model: I(1)

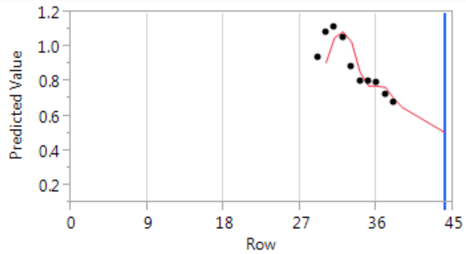
Model Summary

DF	8	Stable	Yes
Sum of Squared Errors	0.06179683	Invertible	Yes
Variance Estimate	0.0077246		
Standard Deviation	0.08788972		
Akaike's 'A' Information Criterion	-17.289257		
Schwarz's Bayesian Criterion	-17.092032		
RSquare	0.70679932		
RSquare Adj	0.70679932		
MAPE	6.86749287		
MAE	0.06350187		
-2LogLikelihood	-19.289257		

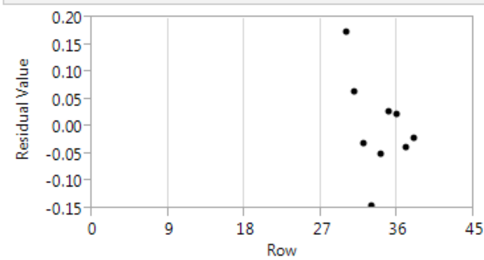
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0288480	0.0276218	-1.04	0.3268	-0.028848

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.3225		1.2869	0.2566	1	0.3225	
2	-0.3169		2.7075	0.2583	2	-0.4698	
3	-0.5032		6.8847	0.0757	3	-0.2885	
4	-0.0171		6.8905	0.1418	4	0.2197	
5	0.1699		7.6050	0.1794	5	-0.2295	
6	0.0327		7.6402	0.2657	6	-0.1555	
7	-0.1278		8.4483	0.2947	7	0.0535	
8	-0.0601		8.8057	0.3589	8	-0.0927	
9	0.0000		.	.	9	-0.1717	
10	0.0000		.	.	10	-0.0157	
11	0.0000		.	.	11	-0.0056	
12	0.0000		.	.	12	-0.1566	
13	0.0000		.	.	13	-0.0354	
14	0.0000		.	.	14	0.0197	
15	0.0000		.	.	15	-0.1202	
16	0.0000		.	.	16	-0.0563	
17	0.0000		.	.	17	0.0177	
18	0.0000		.	.	18	-0.0793	
19	0.0000		.	.	19	-0.0718	
20	0.0000		.	.	20	0.0095	
21	0.0000		.	.	21	-0.0458	
22	0.0000		.	.	22	-0.0759	
23	0.0000		.	.	23	-0.0027	
24	0.0000		.	.	24	-0.0236	
25	0.0000		.	.	25	-0.0701	

Model: I(1)

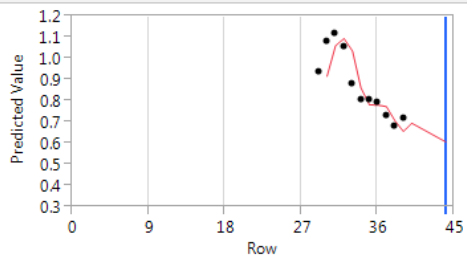
Model Summary

DF	9	Stable	Yes
Sum of Squared Errors	0.06588464	Invertible	Yes
Variance Estimate	0.00732052		
Standard Deviation	0.08556001		
Akaike's 'A' Information Criterion	-19.84558		
Schwarz's Bayesian Criterion	-19.542995		
RSquare	0.72033141		
RSquare Adj	0.72033141		
MAPE	7.1503407		
MAE	0.06389112		
-2LogLikelihood	-21.84558		

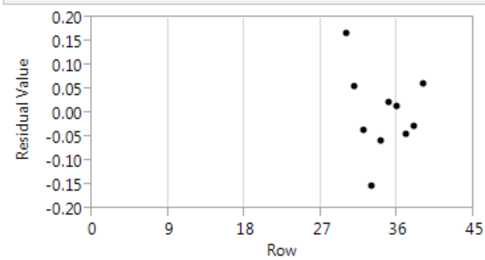
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0221085	0.0256675	-0.86	0.4114	-0.0221085

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.2976	1.1808	0.2772	1	0.2976
2	-0.3154	2.6727	0.2628	2	-0.4432
3	-0.4370	5.9460	0.1143	3	-0.2316
4	0.0123	5.9490	0.2030	4	0.1668
5	0.1043	6.2101	0.2863	5	-0.2452
6	-0.1247	6.6767	0.3518	6	-0.2599
7	-0.1708	7.8436	0.3466	7	0.0213
8	-0.0197	7.8668	0.4466	8	-0.1691
9	0.1534	10.6896	0.2976	9	-0.0638
10	0.0000	.	.	10	-0.1688
11	0.0000	.	.	11	0.0562
12	0.0000	.	.	12	-0.1139
13	0.0000	.	.	13	-0.1909
14	0.0000	.	.	14	0.0825
15	0.0000	.	.	15	-0.0938
16	0.0000	.	.	16	-0.1654
17	0.0000	.	.	17	0.0725
18	0.0000	.	.	18	-0.0923
19	0.0000	.	.	19	-0.0788
20	0.0000	.	.	20	-0.0398
21	0.0000	.	.	21	-0.0176
22	0.0000	.	.	22	-0.0449
23	0.0000	.	.	23	-0.1069
24	0.0000	.	.	24	0.0325
25	0.0000	.	.	25	-0.0305

Model: I(1)

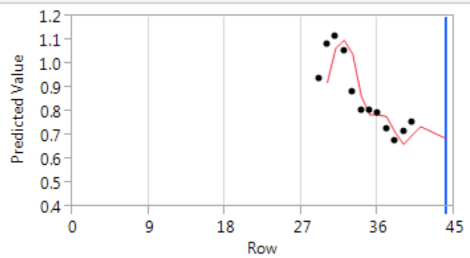
Model Summary

DF	10	Stable	Yes
Sum of Squared Errors	0.0690045	Invertible	Yes
Variance Estimate	0.00690045		
Standard Deviation	0.08306894		
Akaike's 'A' Information Criterion	-22.56962		
Schwarz's Bayesian Criterion	-22.171725		
RSquare	0.72083652		
RSquare Adj	0.72083652		
MAPE	7.16421756		
MAE	0.06292432		
-2LogLikelihood	-24.56962		

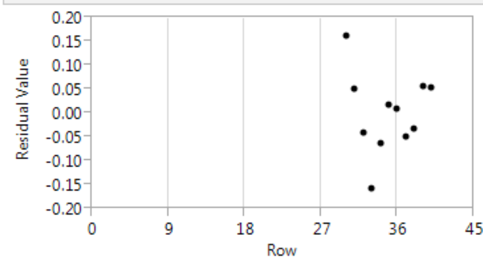
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0167829	0.0238788	-0.70	0.4982	-0.0167829

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3481	1.7326	0.1881	1	0.3481
2	-0.3040	3.2007	0.2018	2	-0.4837
3	-0.4394	6.6527	0.0838	3	-0.1695
4	0.0243	6.6647	0.1547	4	0.2351
5	0.1140	6.9746	0.2225	5	-0.3158
6	-0.1685	7.7863	0.2542	6	-0.2807
7	-0.2969	10.9377	0.1414	7	-0.0123
8	-0.0705	11.1744	0.1920	8	-0.1715
9	0.1684	13.2022	0.1537	9	-0.1479
10	0.1245	15.4175	0.1176	10	-0.0511
11	0.0000	.	.	11	-0.0485
12	0.0000	.	.	12	-0.0685
13	0.0000	.	.	13	-0.2116
14	0.0000	.	.	14	-0.0326
15	0.0000	.	.	15	-0.0140
16	0.0000	.	.	16	-0.2014
17	0.0000	.	.	17	-0.0157
18	0.0000	.	.	18	0.0157
19	0.0000	.	.	19	-0.1646
20	0.0000	.	.	20	-0.0655
21	0.0000	.	.	21	-0.0084
22	0.0000	.	.	22	-0.0853
23	0.0000	.	.	23	-0.0817
24	0.0000	.	.	24	-0.0394
25	0.0000	.	.	25	-0.0130

Model: I(1)

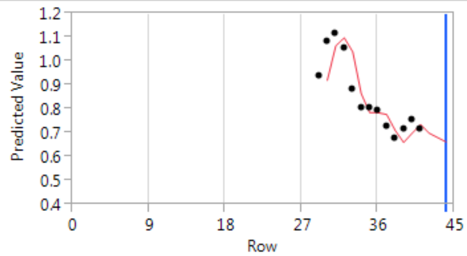
Model Summary

DF	11	Stable	Yes
Sum of Squared Errors	0.0693525	Invertible	Yes
Variance Estimate	0.00630477		
Standard Deviation	0.0794026		
Akaike's 'A' Information Criterion	-25.786991		
Schwarz's Bayesian Criterion	-25.302085		
RSquare	0.7381795		
RSquare Adj	0.7381795		
MAPE	6.786377		
MAE	0.05930434		
-2LogLikelihood	-27.786991		

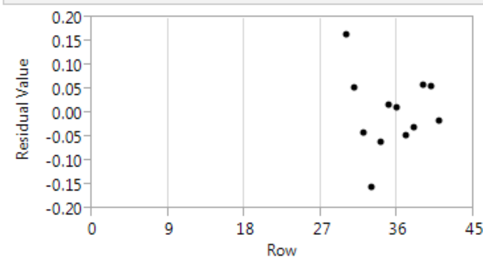
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0184066	0.0219453	-0.84	0.4195	-0.0184066

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.3276		1.6387	0.2005	1	0.3276	
2	-0.3243		3.4053	0.1822	2	-0.4834	
3	-0.4345		6.9287	0.0742	3	-0.1733	
4	0.0360		6.9559	0.1382	4	0.2079	
5	0.1112		7.2527	0.2025	5	-0.3046	
6	-0.1724		8.0845	0.2320	6	-0.2725	
7	-0.2787		10.6944	0.1525	7	-0.0384	
8	-0.0241		10.7188	0.2181	8	-0.1330	
9	0.1857		12.6495	0.1791	9	-0.1514	
10	0.1154		13.7689	0.1838	10	-0.0459	
11	-0.0420		14.0645	0.2294	11	-0.0804	
12	0.0000		.	.	12	-0.0265	
13	0.0000		.	.	13	-0.2282	
14	0.0000		.	.	14	-0.0417	
15	0.0000		.	.	15	0.0300	
16	0.0000		.	.	16	-0.2096	
17	0.0000		.	.	17	-0.0248	
18	0.0000		.	.	18	0.0340	
19	0.0000		.	.	19	-0.1649	
20	0.0000		.	.	20	-0.0644	
21	0.0000		.	.	21	0.0043	
22	0.0000		.	.	22	-0.0833	
23	0.0000		.	.	23	-0.0581	
24	0.0000		.	.	24	-0.0572	
25	0.0000		.	.	25	-0.0056	

Model: I(1)

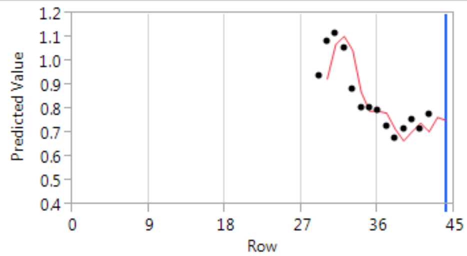
Model Summary

DF	12	Stable	Yes
Sum of Squared Errors	0.07500434	Invertible	Yes
Variance Estimate	0.00625036		
Standard Deviation	0.07905923		
Akaike's 'A' Information Criterion	-28.12466		
Schwarz's Bayesian Criterion	-27.559711		
RSquare	0.721274		
RSquare Adj	0.721274		
MAPE	7.00283313		
MAE	0.06029857		
-2LogLikelihood	-30.12466		

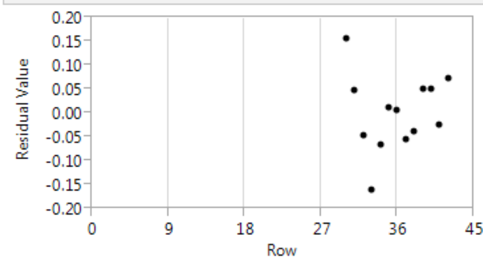
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0123875	0.0210628	-0.59	0.5674	-0.0123875

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.2968		1.4318	0.2315	1	0.2968	
2	-0.2277		2.3510	0.3087	2	-0.3463	
3	-0.3268		4.4336	0.2183	3	-0.1657	
4	0.0071		4.4347	0.3504	4	0.1337	
5	0.0516		4.4997	0.4799	5	-0.1541	
6	-0.1516		5.1396	0.5260	6	-0.2163	
7	-0.2417		7.0387	0.4249	7	-0.1171	
8	-0.0913		7.3635	0.4980	8	-0.1026	
9	-0.0044		7.3644	0.5992	9	-0.2044	
10	0.0423		7.4806	0.6794	10	-0.0556	
11	-0.0054		7.4834	0.7587	11	-0.1221	
12	0.1511		11.9337	0.4510	12	0.0906	
13	0.0000		.	.	13	-0.2680	
14	0.0000		.	.	14	0.0117	
15	0.0000		.	.	15	-0.0413	
16	0.0000		.	.	16	-0.2077	
17	0.0000		.	.	17	-0.0196	
18	0.0000		.	.	18	-0.0318	
19	0.0000		.	.	19	-0.0996	
20	0.0000		.	.	20	-0.0756	
21	0.0000		.	.	21	-0.0007	
22	0.0000		.	.	22	-0.1160	
23	0.0000		.	.	23	-0.0226	
24	0.0000		.	.	24	-0.1239	
25	0.0000		.	.	25	0.0270	

Japan

Model: I(1)

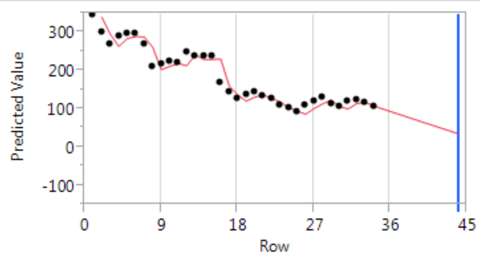
Model Summary

DF	32	Stable	Yes
Sum of Squared Errors	14599.7817	Invertible	Yes
Variance Estimate	456.243179		
Standard Deviation	21.3598497		
Akaike's 'A' Information Criterion	296.694335		
Schwarz's Bayesian Criterion	298.190843		
RSquare	0.90789038		
RSquare Adj	0.90789038		
MAPE	8.64113147		
MAE	15.3648898		
-2LogLikelihood	294.694335		

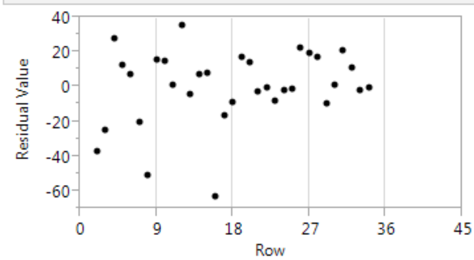
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-7.261664	3.661337	-1.98	0.0560	-7.2616636

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.1686		1.0260	0.3111	1	0.1686	
2	-0.1788		2.2177	0.3299	2	-0.2133	
3	-0.1916		3.6311	0.3041	3	-0.1284	
4	-0.3641		8.9102	0.0634	4	-0.3749	
5	0.1825		10.2839	0.0676	5	0.2964	
6	0.0983		10.6970	0.0982	6	-0.2149	
7	-0.0517		10.8158	0.1469	7	-0.0088	
8	0.2621		13.9902	0.0820	8	0.2461	
9	0.0511		14.1159	0.1183	9	0.1108	
10	-0.1478		15.2125	0.1245	10	-0.2581	
11	-0.1660		16.6589	0.1184	11	-0.0683	
12	-0.2581		20.3236	0.0612	12	-0.0210	
13	0.0852		20.7426	0.0782	13	-0.0012	
14	0.1996		23.1655	0.0576	14	-0.1221	
15	0.0665		23.4494	0.0751	15	0.1223	
16	0.0726		23.8076	0.0938	16	0.0235	
17	-0.0263		23.8573	0.1234	17	0.0476	
18	-0.0741		24.2803	0.1461	18	-0.0447	
19	-0.0527		24.5090	0.1773	19	0.0700	
20	-0.0461		24.6976	0.2132	20	0.0404	
21	0.0800		25.3133	0.2338	21	0.0492	
22	0.1143		26.6852	0.2234	22	-0.0722	
23	-0.0534		27.0141	0.2554	23	-0.1186	
24	-0.1349		29.3485	0.2073	24	-0.1073	
25	-0.0958		30.6737	0.2001	25	-0.0052	

Model: I(1)

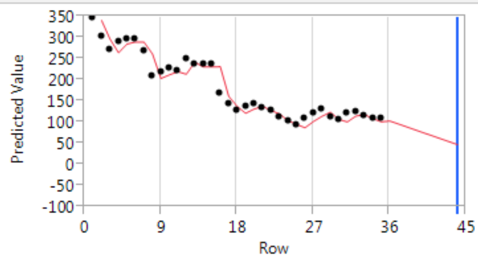
Model Summary

DF	33	Stable	Yes
Sum of Squared Errors	14682.2499	Invertible	Yes
Variance Estimate	444.916663		
Standard Deviation	21.0930477		
Akaike's 'A' Information Criterion	304.800977		
Schwarz's Bayesian Criterion	306.327338		
RSquare	0.91000045		
RSquare Adj	0.91000045		
MAPE	8.63467667		
MAE	15.1681443		
-2LogLikelihood	302.800977		

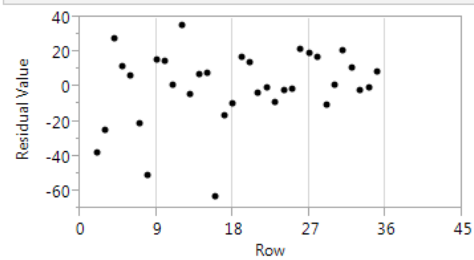
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-6.990553	3.564192	-1.96	0.0583	-6.9905529

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.1666		1.0298	0.3102	1	0.1666	
2	-0.1803		2.2729	0.3210	2	-0.2140	
3	-0.1844		3.6150	0.3062	3	-0.1210	
4	-0.3491		8.5873	0.0723	4	-0.3616	
5	0.1825		9.9936	0.0754	5	0.2910	
6	0.0913		10.3581	0.1104	6	-0.2113	
7	-0.0419		10.4377	0.1651	7	0.0164	
8	0.2723		13.9277	0.0837	8	0.2512	
9	0.0647		14.1324	0.1177	9	0.1230	
10	-0.1471		15.2364	0.1237	10	-0.2465	
11	-0.1650		16.6858	0.1175	11	-0.0410	
12	-0.2610		20.4771	0.0586	12	-0.0552	
13	0.0853		20.9008	0.0749	13	0.0186	
14	0.1976		23.2902	0.0557	14	-0.1176	
15	0.0749		23.6513	0.0713	15	0.1494	
16	0.0827		24.1169	0.0870	16	-0.0084	
17	-0.0319		24.1904	0.1144	17	0.0684	
18	-0.0840		24.7300	0.1325	18	-0.0560	
19	-0.0918		25.4178	0.1472	19	0.0332	
20	-0.0418		25.5708	0.1805	20	0.0509	
21	0.0830		26.2188	0.1982	21	0.0328	
22	0.1099		27.4506	0.1946	22	-0.0807	
23	-0.0319		27.5636	0.2327	23	-0.1149	
24	-0.1339		29.7583	0.1929	24	-0.0934	
25	-0.0861		30.7661	0.1969	25	-0.0093	

Model: I(1)

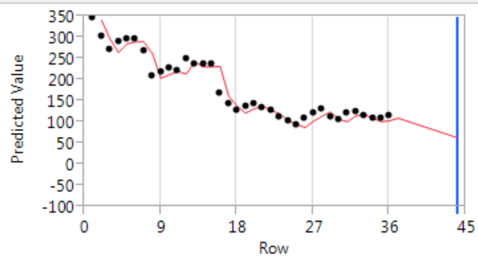
Model Summary

DF	34	Stable	Yes
Sum of Squared Errors	14851.4027	Invertible	Yes
Variance Estimate	436.805961		
Standard Deviation	20.8999034		
Akaike's 'A' Information Criterion	313.093251		
Schwarz's Bayesian Criterion	314.648599		
RSquare	0.91092743		
RSquare Adj	0.91092743		
MAPE	8.70484411		
MAE	15.0794741		
-2LogLikelihood	311.093251		

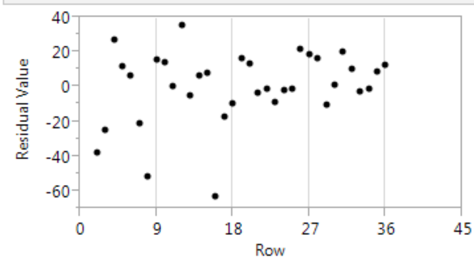
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-6.613531	3.481918	-1.90	0.0660	-6.6135314

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.1717		1.1230	0.2893	1	0.1717	
2	-0.1803		2.3988	0.3014	2	-0.2162	
3	-0.1850		3.7841	0.2857	3	-0.1192	
4	-0.3361		8.5041	0.0748	4	-0.3468	
5	0.1989		10.2111	0.0695	5	0.3095	
6	0.0912		10.5822	0.1022	6	-0.2182	
7	-0.0519		10.7066	0.1519	7	0.0217	
8	0.2830		14.5479	0.0686	8	0.2860	
9	0.0806		14.8716	0.0945	9	0.1290	
10	-0.1260		15.6940	0.1087	10	-0.2392	
11	-0.1627		17.1226	0.1043	11	-0.0355	
12	-0.2584		20.8819	0.0521	12	-0.0046	
13	0.0780		21.2404	0.0683	13	-0.0238	
14	0.1961		23.6110	0.0510	14	-0.0987	
15	0.0708		23.9357	0.0662	15	0.1459	
16	0.0935		24.5312	0.0785	16	0.0418	
17	-0.0172		24.5524	0.1052	17	0.0132	
18	-0.0912		25.1854	0.1199	18	-0.0390	
19	-0.1053		26.0827	0.1279	19	0.0124	
20	-0.0976		26.9053	0.1379	20	0.0042	
21	0.0873		27.6107	0.1515	21	0.0472	
22	0.1129		28.8815	0.1483	22	-0.1112	
23	-0.0372		29.0311	0.1793	23	-0.1302	
24	-0.1028		30.2743	0.1758	24	-0.0748	
25	-0.0846		31.2022	0.1824	25	0.0228	

Model: I(1)

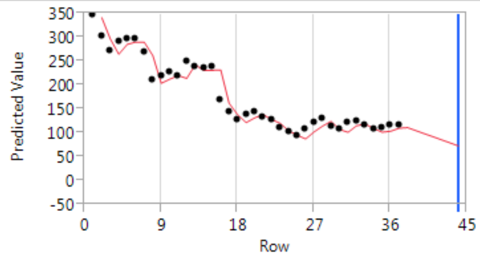
Model Summary

DF	35	Stable	Yes
Sum of Squared Errors	14914.6202	Invertible	Yes
Variance Estimate	426.132007		
Standard Deviation	20.6429651		
Akaike's 'A' Information Criterion	321.120393		
Schwarz's Bayesian Criterion	322.703912		
RSquare	0.91224944		
RSquare Adj	0.91224944		
MAPE	8.64376522		
MAE	14.8597043		
-2LogLikelihood	319.120393		

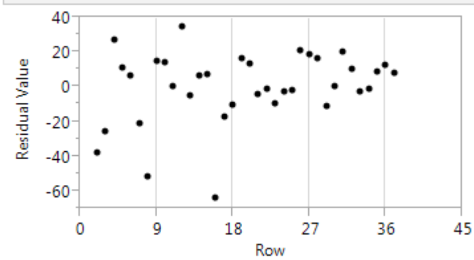
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-6.389539	3.392073	-1.88	0.0679	-6.3895389

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.1773		1.2292	0.2676	1	0.1773	
2	-0.1757		2.4709	0.2907	2	-0.2138	
3	-0.1851		3.8912	0.2735	3	-0.1183	
4	-0.3362		8.7243	0.0684	4	-0.3437	
5	0.2035		10.5523	0.0610	5	0.3217	
6	0.1016		11.0231	0.0877	6	-0.2099	
7	-0.0519		11.1504	0.1322	7	0.0185	
8	0.2756		14.8617	0.0619	8	0.2878	
9	0.0888		15.2616	0.0840	9	0.1480	
10	-0.1154		15.9620	0.1007	10	-0.2427	
11	-0.1498		17.1893	0.1024	11	-0.0245	
12	-0.2572		20.9611	0.0510	12	0.0039	
13	0.0775		21.3180	0.0669	13	0.0012	
14	0.1914		23.5959	0.0512	14	-0.1315	
15	0.0698		23.9136	0.0666	15	0.1662	
16	0.0907		24.4766	0.0796	16	0.0370	
17	-0.0103		24.4842	0.1069	17	0.0313	
18	-0.0819		24.9940	0.1251	18	-0.0748	
19	-0.1098		25.9636	0.1312	19	0.0283	
20	-0.1063		26.9294	0.1373	20	-0.0066	
21	0.0525		27.1810	0.1649	21	0.0097	
22	0.1154		28.4822	0.1602	22	-0.1039	
23	-0.0347		28.6086	0.1936	23	-0.1412	
24	-0.1060		29.8900	0.1884	24	-0.0769	
25	-0.0661		30.4340	0.2084	25	0.0337	

Model: I(1)

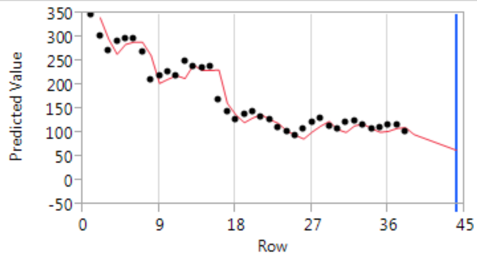
Model Summary

DF	36	Stable	Yes
Sum of Squared Errors	14976.6131	Invertible	Yes
Variance Estimate	416.017031		
Standard Deviation	20.3964955		
Akaike's 'A' Information Criterion	329.124559		
Schwarz's Bayesian Criterion	330.735477		
RSquare	0.91431774		
RSquare Adj	0.91431774		
MAPE	8.62205819		
MAE	14.6913167		
-2LogLikelihood	327.124559		

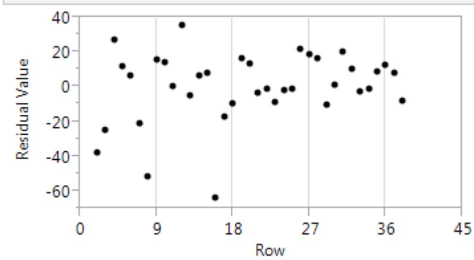
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-6.605273	3.307330	-2.00	0.0534	-6.605273

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.1730	1.1993	0.2735	1	0.1730
2	-0.1809	2.5479	0.2797	2	-0.2173
3	-0.1886	4.0568	0.2554	3	-0.1221
4	-0.3342	8.9395	0.0626	4	-0.3438
5	0.2041	10.8180	0.0551	5	0.3137
6	0.0960	11.2474	0.0810	6	-0.2143
7	-0.0617	11.4302	0.1209	7	0.0045
8	0.2745	15.1805	0.0557	8	0.2928
9	0.0944	15.6393	0.0748	9	0.1478
10	-0.1234	16.4526	0.0874	10	-0.2590
11	-0.1596	17.8661	0.0847	11	-0.0322
12	-0.2682	22.0171	0.0373*	12	-0.0017
13	0.0770	22.3738	0.0498*	13	-0.0029
14	0.1908	24.6568	0.0381*	14	-0.1568
15	0.0743	25.0188	0.0497*	15	0.1922
16	0.0913	25.5911	0.0601	16	0.0311
17	-0.0078	25.5954	0.0822	17	0.0319
18	-0.0885	26.1906	0.0955	18	-0.0994
19	-0.1182	27.3115	0.0976	19	0.0625
20	-0.1009	28.1761	0.1053	20	-0.0129
21	0.0613	28.5148	0.1261	21	0.0160
22	0.1490	30.6504	0.1035	22	-0.0721
23	-0.0374	30.7946	0.1279	23	-0.1530
24	-0.1080	32.0883	0.1248	24	-0.0620
25	-0.0626	32.5588	0.1425	25	0.0426

Model: I(1)

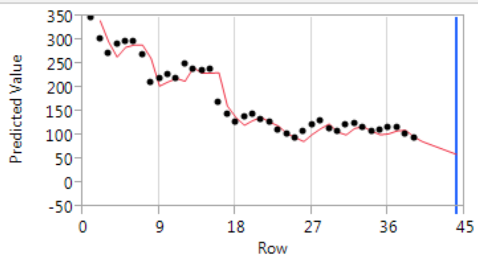
Model Summary

DF	37	Stable	Yes
Sum of Squared Errors	14985.9861	Invertible	Yes
Variance Estimate	405.026651		
Standard Deviation	20.1252739		
Akaike's 'A' Information Criterion	336.976144		
Schwarz's Bayesian Criterion	338.61373		
RSquare	0.91709092		
RSquare Adj	0.91709092		
MAPE	8.48121951		
MAE	14.3906485		
-2LogLikelihood	334.976144		

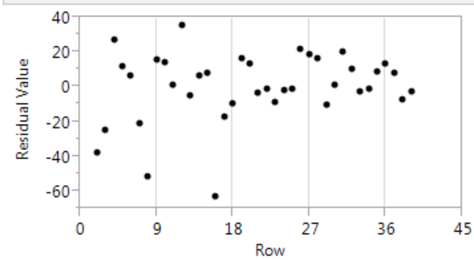
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-6.686921	3.221508	-2.08	0.0449*	-6.6869211

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.1747		1.2535	0.2629	1	0.1747	
2	-0.1820		2.6526	0.2655	2	-0.2192	
3	-0.1909		4.2351	0.2372	3	-0.1233	
4	-0.3357		9.2720	0.0546	4	-0.3452	
5	0.2042		11.1926	0.0477*	5	0.3152	
6	0.0966		11.6363	0.0706	6	-0.2185	
7	-0.0633		11.8330	0.1062	7	0.0036	
8	0.2704		15.5376	0.0495*	8	0.2884	
9	0.0942		16.0030	0.0668	9	0.1494	
10	-0.1210		16.7980	0.0790	10	-0.2616	
11	-0.1630		18.2934	0.0750	11	-0.0387	
12	-0.2721		22.6202	0.0311*	12	-0.0031	
13	0.0723		22.9378	0.0424*	13	-0.0048	
14	0.1905		25.2371	0.0323*	14	-0.1612	
15	0.0746		25.6053	0.0424*	15	0.1848	
16	0.0931		26.2043	0.0512	16	0.0421	
17	-0.0074		26.2082	0.0707	17	0.0285	
18	-0.0876		26.7919	0.0830	18	-0.1021	
19	-0.1210		27.9628	0.0841	19	0.0559	
20	-0.1043		28.8822	0.0901	20	0.0001	
21	0.0631		29.2386	0.1084	21	0.0119	
22	0.1524		31.4453	0.0874	22	-0.0714	
23	-0.0242		31.5044	0.1109	23	-0.1375	
24	-0.1090		32.7955	0.1085	24	-0.0655	
25	-0.0636		33.2686	0.1245	25	0.0477	

Model: I(1)

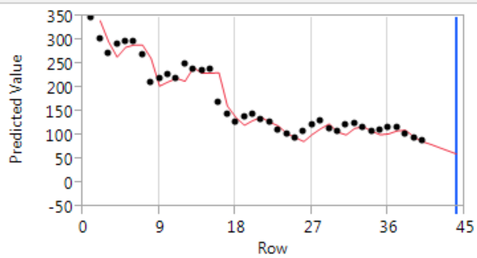
Model Summary

DF	38	Stable	Yes
Sum of Squared Errors	14986.5879	Invertible	Yes
Variance Estimate	394.383892		
Standard Deviation	19.859101		
Akaike's 'A' Information Criterion	344.779828		
Schwarz's Bayesian Criterion	346.44339		
RSquare	0.91999298		
RSquare Adj	0.91999298		
MAPE	8.28638409		
MAE	14.0402592		
-2LogLikelihood	342.779828		

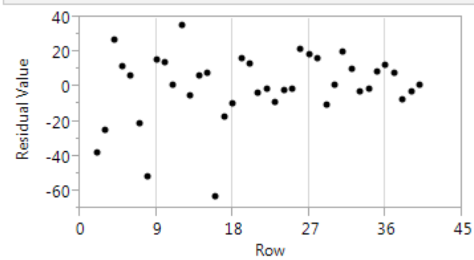
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-6.666769	3.138886	-2.12	0.0402*	-6.6667693

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.1745	1.2808	0.2578	1	0.1745
2	-0.1825	2.7204	0.2566	2	-0.2196
3	-0.1905	4.3326	0.2277	3	-0.1228
4	-0.3350	9.4600	0.0506	4	-0.3449
5	0.2046	11.4293	0.0435*	5	0.3154
6	0.0966	11.8810	0.0647	6	-0.2189
7	-0.0636	12.0830	0.0979	7	0.0048
8	0.2709	15.8670	0.0443*	8	0.2887
9	0.0953	16.3506	0.0599	9	0.1506
10	-0.1210	17.1577	0.0709	10	-0.2617
11	-0.1635	18.6843	0.0670	11	-0.0384
12	-0.2712	23.0388	0.0274*	12	-0.0017
13	0.0733	23.3692	0.0375*	13	-0.0039
14	0.1917	25.7206	0.0281*	14	-0.1605
15	0.0746	26.0911	0.0371*	15	0.1851
16	0.0930	26.6922	0.0450*	16	0.0445
17	-0.0079	26.6967	0.0627	17	0.0261
18	-0.0877	27.2824	0.0738	18	-0.1014
19	-0.1212	28.4561	0.0750	19	0.0557
20	-0.1036	29.3599	0.0809	20	0.0028
21	0.0640	29.7239	0.0977	21	0.0087
22	0.1519	31.8946	0.0792	22	-0.0709
23	-0.0251	31.9573	0.1010	23	-0.1382
24	-0.1124	33.3038	0.0978	24	-0.0690
25	-0.0633	33.7611	0.1131	25	0.0487

Model: I(1)

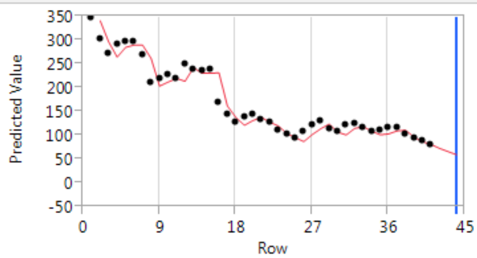
Model Summary

DF	39	Stable	Yes
Sum of Squared Errors	14988.549	Invertible	Yes
Variance Estimate	384.321769		
Standard Deviation	19.6041263		
Akaike's 'A' Information Criterion	352.561576		
Schwarz's Bayesian Criterion	354.250455		
RSquare	0.9230868		
RSquare Adj	0.9230868		
MAPE	8.12315818		
MAE	13.7264813		
-2LogLikelihood	350.561576		

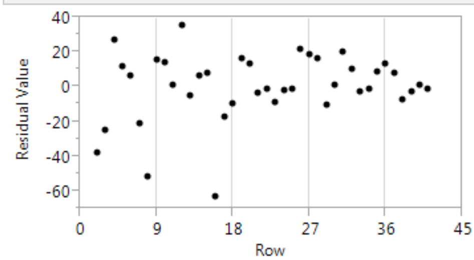
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-6.702225	3.060929	-2.19	0.0346*	-6.702225

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value
0	1.0000	.	.
1	0.1745	1.3111	0.2522
2	-0.1821	2.7764	0.2495
3	-0.1897	4.4100	0.2205
4	-0.3357	9.6675	0.0464*
5	0.2034	11.6540	0.0398*
6	0.0958	12.1074	0.0596
7	-0.0633	12.3114	0.0908
8	0.2712	16.1727	0.0400*
9	0.0944	16.6553	0.0544
10	-0.1228	17.5001	0.0640
11	-0.1636	19.0507	0.0602
12	-0.2702	23.4300	0.0243*
13	0.0717	23.7497	0.0335*
14	0.1898	26.0782	0.0253*
15	0.0725	26.4318	0.0337*
16	0.0931	27.0389	0.0411*
17	-0.0076	27.0431	0.0574
18	-0.0868	27.6190	0.0681
19	-0.1211	28.7913	0.0693
20	-0.1033	29.6871	0.0751
21	0.0627	30.0350	0.0913
22	0.1503	32.1441	0.0750
23	-0.0242	32.2018	0.0960
24	-0.1108	33.4901	0.0941
25	-0.0573	33.8576	0.1110

Lag	Partial
0	1.0000
1	0.1745
2	-0.2192
3	-0.1221
4	-0.3456
5	0.3149
6	-0.2195
7	0.0056
8	0.2870
9	0.1491
10	-0.2633
11	-0.0374
12	-0.0029
13	-0.0070
14	-0.1609
15	0.1840
16	0.0427
17	0.0222
18	-0.0961
19	0.0539
20	0.0024
21	0.0048
22	-0.0643
23	-0.1397
24	-0.0682
25	0.0549

Model: I(1)

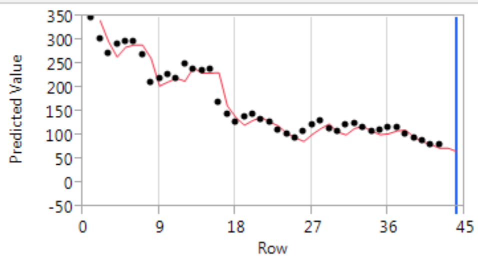
Model Summary

DF	40	Stable	Yes
Sum of Squared Errors	15033.9739	Invertible	Yes
Variance Estimate	375.849347		
Standard Deviation	19.3868344		
Akaike's 'A' Information Criterion	360.437287		
Schwarz's Bayesian Criterion	362.150859		
RSquare	0.92559181		
RSquare Adj	0.92559181		
MAPE	8.13099561		
MAE	13.5459388		
-2LogLikelihood	358.437287		

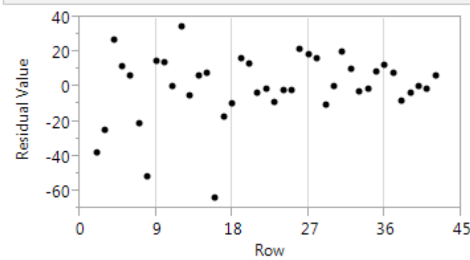
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-6.535798	2.990486	-2.19	0.0348*	-6.5357976

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.1729	1.3173	0.2511	1	0.1729
2	-0.1819	2.8124	0.2451	2	-0.2183
3	-0.1909	4.5027	0.2120	3	-0.1243
4	-0.3384	9.9603	0.0411*	4	-0.3483
5	0.2062	12.0423	0.0342*	5	0.3171
6	0.1009	12.5549	0.0507	6	-0.2143
7	-0.0601	12.7421	0.0786	7	0.0047
8	0.2692	16.6149	0.0344*	8	0.2859
9	0.0924	17.0855	0.0474*	9	0.1569
10	-0.1183	17.8810	0.0570	10	-0.2563
11	-0.1538	19.2718	0.0564	11	-0.0286
12	-0.2688	23.6657	0.0226*	12	-0.0066
13	0.0669	23.9476	0.0316*	13	-0.0058
14	0.1970	26.4818	0.0225*	14	-0.1435
15	0.0806	26.9225	0.0294*	15	0.1852
16	0.1023	27.6607	0.0347*	16	0.0489
17	-0.0085	27.6660	0.0490*	17	0.0266
18	-0.0876	28.2539	0.0583	18	-0.0709
19	-0.1247	29.4992	0.0585	19	0.0235
20	-0.1035	30.3981	0.0637	20	0.0110
21	0.0608	30.7241	0.0784	21	0.0031
22	0.1559	32.9782	0.0622	22	-0.0396
23	-0.0166	33.0052	0.0810	23	-0.1703
24	-0.1148	34.3708	0.0783	24	-0.0604
25	-0.0646	34.8310	0.0913	25	0.0461

Norway

Model: I(1)

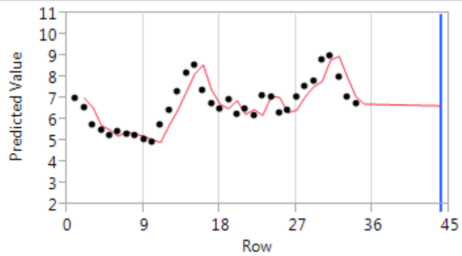
Model Summary

DF	32	Stable	Yes
Sum of Squared Errors	11.5553431	Invertible	Yes
Variance Estimate	0.36110447		
Standard Deviation	0.60091969		
Akaike's 'A' Information Criterion	61.0210756		
Schwarz's Bayesian Criterion	62.5175832		
RSquare	0.69572126		
RSquare Adj	0.69572126		
MAPE	7.23189546		
MAE	0.4957405		
-2LogLikelihood	59.0210756		

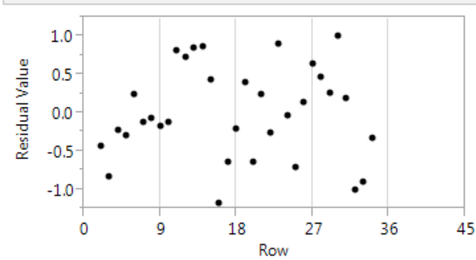
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0085545	0.1024230	-0.08	0.9340	-0.0085545

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.3660		4.8338	0.0279*	1	0.3660	
2	-0.0078		4.8361	0.0891	2	-0.1637	
3	-0.1982		6.3478	0.0959	3	-0.1601	
4	-0.0874		6.6522	0.1554	4	0.0604	
5	-0.2551		9.3356	0.0964	5	-0.3185	
6	-0.1865		10.8231	0.0940	6	-0.0194	
7	-0.0112		10.8287	0.1463	7	0.0729	
8	0.0507		10.9476	0.2047	8	-0.1296	
9	-0.0611		11.1272	0.2671	9	-0.0967	
10	-0.2408		14.0391	0.1712	10	-0.2867	
11	-0.1904		15.9425	0.1433	11	-0.1355	
12	-0.0181		15.9606	0.1930	12	0.0321	
13	0.0441		16.0728	0.2452	13	-0.1412	
14	-0.0016		16.0730	0.3089	14	-0.1388	
15	0.2417		19.8227	0.1788	15	0.2217	
16	0.3163		26.6211	0.0459*	16	-0.0038	
17	0.2594		31.4794	0.0175*	17	0.1553	
18	0.0019		31.4797	0.0253*	18	0.0109	
19	-0.1060		32.4064	0.0281*	19	-0.1775	
20	-0.1972		35.8603	0.0160*	20	-0.0427	
21	-0.1821		39.0508	0.0097*	21	-0.0771	
22	-0.0416		39.2327	0.0133*	22	0.1145	
23	-0.0131		39.2525	0.0186*	23	-0.0663	
24	-0.0242		39.3274	0.0252*	24	-0.1896	
25	-0.0624		39.8902	0.0299*	25	0.0228	

Model: I(1)

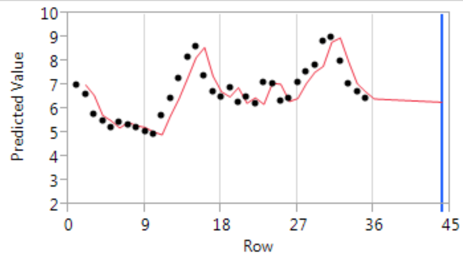
Model Summary

DF	33	Stable	Yes
Sum of Squared Errors	11.6370515	Invertible	Yes
Variance Estimate	0.35263792		
Standard Deviation	0.59383325		
Akaike's 'A' Information Criterion	62.0341619		
Schwarz's Bayesian Criterion	63.5605224		
RSquare	0.69407345		
RSquare Adj	0.69407345		
MAPE	7.12671438		
MAE	0.48868962		
-2LogLikelihood	60.0341619		

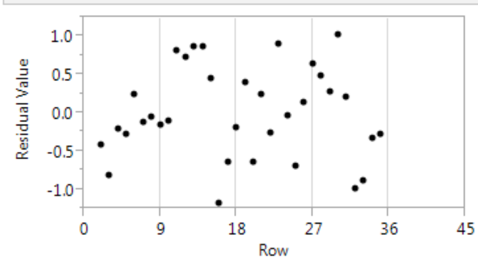
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0170882	0.0998988	-0.17	0.8652	-0.0170882

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3720	5.1318	0.0235*	1	0.3720
2	0.0157	5.1413	0.0765	2	-0.1424
3	-0.1698	6.2793	0.0988	3	-0.1463
4	-0.0887	6.6002	0.1586	4	0.0431
5	-0.2760	9.8149	0.0807	5	-0.3227
6	-0.1898	11.3899	0.0770	6	0.0014
7	-0.0212	11.4103	0.1217	7	0.0559
8	0.0361	11.4716	0.1764	8	-0.1199
9	-0.0628	11.6647	0.2329	9	-0.0844
10	-0.2209	14.1538	0.1661	10	-0.2862
11	-0.1877	16.0287	0.1401	11	-0.1325
12	-0.0405	16.1199	0.1858	12	0.0257
13	0.0490	16.2600	0.2354	13	-0.0877
14	-0.0091	16.2650	0.2975	14	-0.1615
15	0.2552	20.4592	0.1550	15	0.2488
16	0.3042	26.7533	0.0443*	16	-0.0169
17	0.2627	31.7215	0.0163*	17	0.1467
18	0.0178	31.7459	0.0236*	18	0.0321
19	-0.0750	32.2045	0.0296*	19	-0.1783
20	-0.2054	35.8942	0.0158*	20	-0.0584
21	-0.2012	39.7040	0.0081*	21	-0.0645
22	-0.0627	40.1045	0.0105*	22	0.0945
23	-0.0317	40.2161	0.0145*	23	-0.0718
24	-0.0449	40.4633	0.0191*	24	-0.1676
25	-0.0604	40.9598	0.0232*	25	-0.0192

Model: I(1)

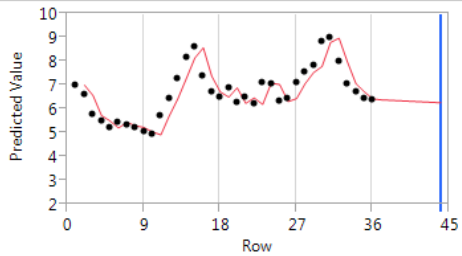
Model Summary

DF	34	Stable	Yes
Sum of Squared Errors	11.6372589	Invertible	Yes
Variance Estimate	0.34227232		
Standard Deviation	0.58504044		
Akaike's 'A' Information Criterion	62.7859325		
Schwarz's Bayesian Criterion	64.3412806		
RSquare	0.6946709		
RSquare Adj	0.6946709		
MAPE	6.92823492		
MAE	0.4750849		
-2LogLikelihood	60.7859325		

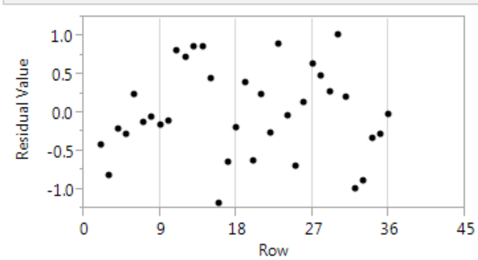
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0175057	0.0976062	-0.18	0.8587	-0.0175057

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3723	5.2801	0.0216*	1	0.3723
2	0.0161	5.2903	0.0710	2	-0.1422
3	-0.1686	6.4405	0.0920	3	-0.1452
4	-0.0873	6.7590	0.1492	4	0.0439
5	-0.2761	10.0493	0.0739	5	-0.3236
6	-0.1910	11.6776	0.0696	6	0.0015
7	-0.0214	11.6988	0.1109	7	0.0571
8	0.0356	11.7596	0.1623	8	-0.1210
9	-0.0635	11.9606	0.2155	9	-0.0840
10	-0.2211	14.4918	0.1517	10	-0.2857
11	-0.1868	16.3749	0.1278	11	-0.1320
12	-0.0405	16.4671	0.1708	12	0.0263
13	0.0478	16.6018	0.2182	13	-0.0884
14	-0.0088	16.6067	0.2777	14	-0.1590
15	0.2548	20.8109	0.1430	15	0.2480
16	0.3050	27.1518	0.0398*	16	-0.0157
17	0.2622	32.0973	0.0146*	17	0.1457
18	0.0181	32.1222	0.0213*	18	0.0316
19	-0.0742	32.5672	0.0270*	19	-0.1776
20	-0.2039	36.1572	0.0147*	20	-0.0580
21	-0.2016	39.9181	0.0076*	21	-0.0648
22	-0.0637	40.3226	0.0099*	22	0.0940
23	-0.0328	40.4384	0.0137*	23	-0.0726
24	-0.0459	40.6860	0.0180*	24	-0.1679
25	-0.0615	41.1756	0.0220*	25	-0.0183

Model: I(1)

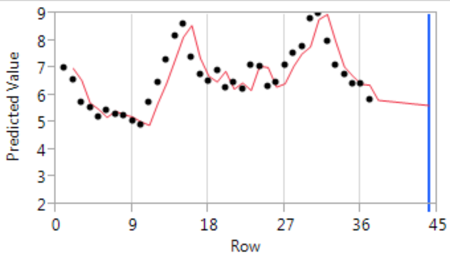
Model Summary

DF	35	Stable	Yes
Sum of Squared Errors	11.9168812	Invertible	Yes
Variance Estimate	0.34048232		
Standard Deviation	0.58350863		
Akaike's 'A' Information Criterion	64.3633081		
Schwarz's Bayesian Criterion	65.9468271		
RSquare	0.69265642		
RSquare Adj	0.69265642		
MAPE	6.93611446		
MAE	0.47434136		
-2LogLikelihood	62.3633081		

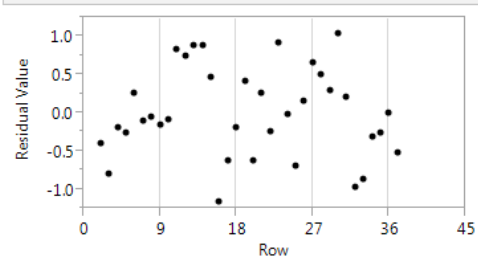
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0324028	0.0959127	-0.34	0.7375	-0.0324028

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3647	5.1996	0.0226*	1	0.3647
2	0.0299	5.2356	0.0730	2	-0.1189
3	-0.1480	6.1434	0.1048	3	-0.1367
4	-0.0425	6.2208	0.1833	4	0.0801
5	-0.2212	8.3799	0.1365	5	-0.2842
6	-0.1905	10.0349	0.1232	6	-0.0396
7	-0.0622	10.2173	0.1766	7	0.0490
8	0.0262	10.2509	0.2479	8	-0.0721
9	-0.0803	10.5777	0.3058	9	-0.1173
10	-0.2430	13.6846	0.1879	10	-0.2584
11	-0.1887	15.6327	0.1553	11	-0.0994
12	-0.0091	15.6374	0.2084	12	0.0343
13	0.0466	15.7665	0.2620	13	-0.0734
14	-0.0513	15.9300	0.3177	14	-0.1690
15	0.2589	20.2960	0.1609	15	0.3187
16	0.2862	25.9000	0.0555	16	-0.0506
17	0.2839	31.7048	0.0164*	17	0.1766
18	-0.0010	31.7049	0.0238*	18	-0.0257
19	-0.0635	32.0296	0.0310*	19	-0.1649
20	-0.1705	34.5144	0.0228*	20	-0.0350
21	-0.1430	36.3784	0.0198*	21	-0.0645
22	-0.0813	37.0235	0.0235*	22	0.0857
23	-0.0707	37.5490	0.0285*	23	-0.1112
24	-0.0831	38.3359	0.0320*	24	-0.1771
25	-0.0937	39.4283	0.0334*	25	-0.0110

Model: I(1)

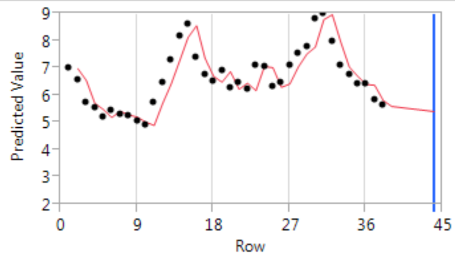
Model Summary

DF	36	Stable	Yes
Sum of Squared Errors	11.9508314	Invertible	Yes
Variance Estimate	0.33196754		
Standard Deviation	0.57616624		
Akaike's 'A' Information Criterion	65.1871201		
Schwarz's Bayesian Criterion	66.798038		
RSquare	0.69962637		
RSquare Adj	0.69962637		
MAPE	6.82202757		
MAE	0.46588766		
-2LogLikelihood	63.1871201		

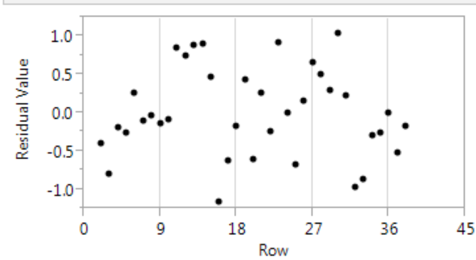
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0374514	0.0933294	-0.40	0.6906	-0.0374514

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3720	5.5473	0.0185*	1	0.3720
2	0.0306	5.5858	0.0612	2	-0.1251
3	-0.1426	6.4488	0.0917	3	-0.1283
4	-0.0366	6.5073	0.1643	4	0.0848
5	-0.2059	8.4192	0.1346	5	-0.2737
6	-0.1732	9.8154	0.1326	6	-0.0225
7	-0.0635	10.0093	0.1880	7	0.0352
8	0.0118	10.0162	0.2639	8	-0.0765
9	-0.0831	10.3723	0.3212	9	-0.1005
10	-0.2491	13.6894	0.1876	10	-0.2674
11	-0.1980	15.8652	0.1462	11	-0.0879
12	-0.0117	15.8731	0.1971	12	0.0457
13	0.0566	16.0654	0.2456	13	-0.0718
14	-0.0515	16.2317	0.2994	14	-0.1635
15	0.2437	20.1278	0.1671	15	0.3195
16	0.2891	25.8691	0.0559	16	-0.0318
17	0.2790	31.4869	0.0174*	17	0.1555
18	0.0084	31.4922	0.0252*	18	-0.0112
19	-0.0697	31.8817	0.0322*	19	-0.1793
20	-0.1672	34.2542	0.0245*	20	-0.0369
21	-0.1327	35.8417	0.0228*	21	-0.0568
22	-0.0629	36.2220	0.0287*	22	0.0820
23	-0.0773	36.8375	0.0338*	23	-0.1149
24	-0.0962	37.8647	0.0358*	24	-0.1797
25	-0.1070	39.2425	0.0348*	25	-0.0138

Model: I(1)

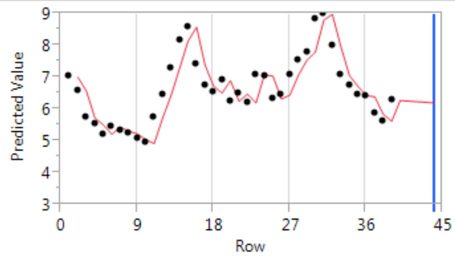
Model Summary

DF	37	Stable	Yes
Sum of Squared Errors	12.4167587	Invertible	Yes
Variance Estimate	0.33558807		
Standard Deviation	0.57929964		
Akaike's 'A' Information Criterion	67.334843		
Schwarz's Bayesian Criterion	68.9724292		
RSquare	0.68878766		
RSquare Adj	0.68878766		
MAPE	6.99133949		
MAE	0.47440305		
-2LogLikelihood	65.334843		

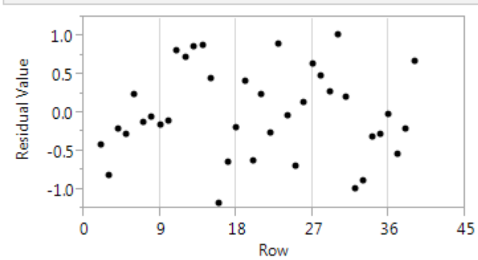
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0192474	0.0925914	-0.21	0.8365	-0.0192474

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3473	4.9557	0.0260*	1	0.3473
2	-0.0014	4.9558	0.0839	2	-0.1388
3	-0.1401	5.8076	0.1214	3	-0.1059
4	-0.0533	5.9346	0.2041	4	0.0430
5	-0.2186	8.1358	0.1489	5	-0.2657
6	-0.2191	10.4162	0.1082	6	-0.0848
7	-0.1210	11.1335	0.1329	7	-0.0307
8	0.0164	11.1472	0.1935	8	-0.0183
9	-0.0289	11.1910	0.2628	9	-0.0927
10	-0.2278	14.0073	0.1727	10	-0.3061
11	-0.1653	15.5451	0.1589	11	-0.0802
12	0.0249	15.5815	0.2112	12	0.0000
13	0.0649	15.8376	0.2580	13	-0.0993
14	-0.0852	16.2971	0.2956	14	-0.2043
15	0.2338	19.9091	0.1754	15	0.2846
16	0.3284	27.3609	0.0376*	16	0.0344
17	0.2550	32.0676	0.0148*	17	0.0426
18	0.0230	32.1077	0.0214*	18	0.0548
19	-0.1018	32.9363	0.0244*	19	-0.1522
20	-0.1382	34.5492	0.0226*	20	-0.0379
21	-0.1385	36.2637	0.0204*	21	-0.0507
22	-0.0948	37.1173	0.0230*	22	0.0851
23	-0.1395	39.0903	0.0194*	23	-0.1359
24	-0.0697	39.6184	0.0235*	24	-0.1575
25	-0.0556	39.9800	0.0293*	25	-0.0115

Model: I(1)

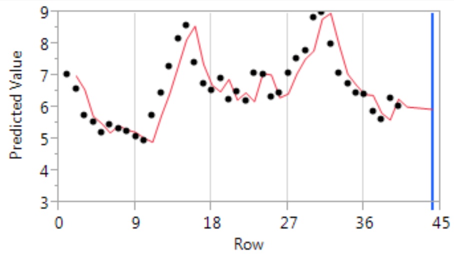
Model Summary

DF	38	Stable	Yes
Sum of Squared Errors	12.4667246	Invertible	Yes
Variance Estimate	0.3280717		
Standard Deviation	0.57277544		
Akaike's 'A' Information Criterion	68.1977608		
Schwarz's Bayesian Criterion	69.8613225		
RSquare	0.69003938		
RSquare Adj	0.69003938		
MAPE	6.88571552		
MAE	0.46700316		
-2LogLikelihood	66.1977608		

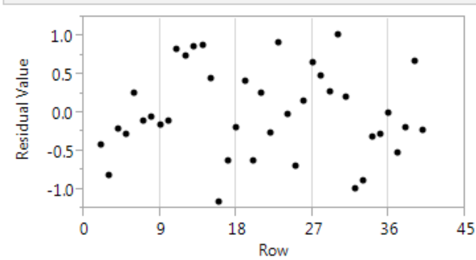
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0250538	0.0906730	-0.28	0.7838	-0.0250538

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3339	4.6909	0.0303*	1	0.3339
2	0.0025	4.6912	0.0958	2	-0.1227
3	-0.1293	5.4342	0.1426	3	-0.1021
4	-0.0520	5.5580	0.2347	4	0.0336
5	-0.2120	7.6706	0.1753	5	-0.2479
6	-0.2115	9.8384	0.1316	6	-0.0898
7	-0.1033	10.3721	0.1685	7	-0.0151
8	0.0360	10.4388	0.2356	8	0.0039
9	-0.0304	10.4880	0.3124	9	-0.1038
10	-0.2439	13.7682	0.1838	10	-0.3059
11	-0.1688	15.3963	0.1651	11	-0.0746
12	0.0162	15.4119	0.2197	12	0.0004
13	0.0525	15.5814	0.2725	13	-0.0790
14	-0.0884	16.0809	0.3085	14	-0.1927
15	0.2451	20.0839	0.1687	15	0.2836
16	0.3277	27.5515	0.0357*	16	0.0499
17	0.2378	31.6613	0.0166*	17	0.0319
18	0.0272	31.7177	0.0237*	18	0.0714
19	-0.1058	32.6129	0.0266*	19	-0.1613
20	-0.1263	33.9563	0.0264*	20	-0.0427
21	-0.1451	35.8263	0.0229*	21	-0.0603
22	-0.0912	36.6086	0.0261*	22	0.0931
23	-0.1277	38.2371	0.0240*	23	-0.1383
24	-0.0478	38.4802	0.0309*	24	-0.1504
25	-0.0628	38.9305	0.0374*	25	-0.0099

Model: I(1)

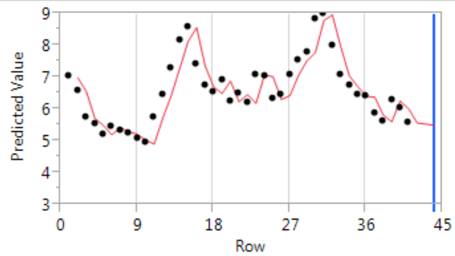
Model Summary

DF	39	Stable	Yes
Sum of Squared Errors	12.6369551	Invertible	Yes
Variance Estimate	0.32402449		
Standard Deviation	0.56923149		
Akaike's 'A' Information Criterion	69.4249232		
Schwarz's Bayesian Criterion	71.1138026		
RSquare	0.69329126		
RSquare Adj	0.69329126		
MAPE	6.85902912		
MAE	0.463875		
-2LogLikelihood	67.4249232		

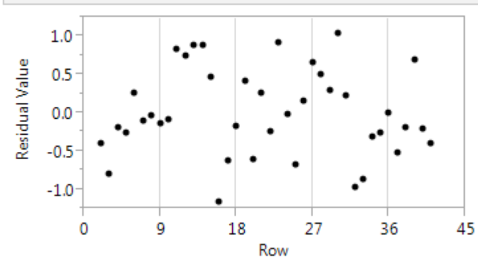
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0355000	0.0889496	-0.40	0.6920	-0.0355

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.3370		4.8926	0.0270*	1	0.3370	
2	-0.0188		4.9083	0.0859	2	-0.1494	
3	-0.1204		5.5666	0.1347	3	-0.0724	
4	-0.0327		5.6165	0.2297	4	0.0403	
5	-0.2075		7.6834	0.1746	5	-0.2607	
6	-0.1982		9.6238	0.1414	6	-0.0568	
7	-0.0898		10.0344	0.1866	7	-0.0205	
8	0.0666		10.2674	0.2468	8	0.0363	
9	0.0056		10.2691	0.3291	9	-0.0678	
10	-0.2445		13.6166	0.1912	10	-0.3232	
11	-0.1984		15.8978	0.1450	11	-0.0675	
12	0.0074		15.9011	0.1958	12	0.0194	
13	0.0352		15.9782	0.2503	13	-0.0822	
14	-0.1098		16.7578	0.2693	14	-0.1633	
15	0.2362		20.5066	0.1533	15	0.3090	
16	0.3460		28.8863	0.0247*	16	0.0525	
17	0.2357		32.9436	0.0115*	17	0.0277	
18	-0.0032		32.9444	0.0170*	18	0.0419	
19	-0.0962		33.6851	0.0200*	19	-0.1187	
20	-0.1332		35.1759	0.0192*	20	-0.0728	
21	-0.1226		36.5053	0.0192*	21	-0.0518	
22	-0.1041		37.5164	0.0207*	22	0.0684	
23	-0.1204		38.9480	0.0201*	23	-0.1276	
24	-0.0262		39.0203	0.0272*	24	-0.1388	
25	-0.0229		39.0791	0.0362*	25	0.0072	

Model: I(1)

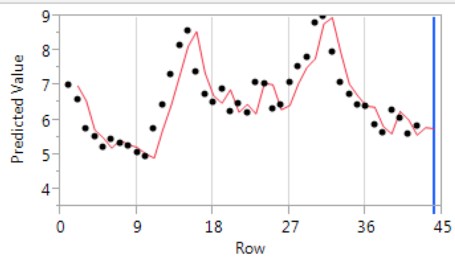
Model Summary

DF	40	Stable	Yes
Sum of Squared Errors	12.6986156	Invertible	Yes
Variance Estimate	0.31746539		
Standard Deviation	0.56344067		
Akaike's 'A' Information Criterion	70.2977171		
Schwarz's Bayesian Criterion	72.0112891		
RSquare	0.69597826		
RSquare Adj	0.69597826		
MAPE	6.81684526		
MAE	0.45955419		
-2LogLikelihood	68.2977171		

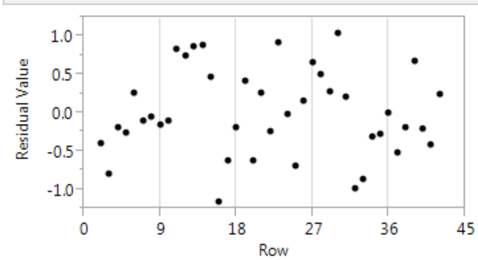
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0293683	0.0867101	-0.34	0.7366	-0.0293683

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.3271		4.7162	0.0299*	1	0.3271	
2	-0.0237		4.7416	0.0934	2	-0.1464	
3	-0.1071		5.2742	0.1528	3	-0.0577	
4	-0.0370		5.3393	0.2542	4	0.0209	
5	-0.2175		7.6561	0.1762	5	-0.2589	
6	-0.1982		9.6341	0.1409	6	-0.0555	
7	-0.0956		10.1085	0.1825	7	-0.0408	
8	0.0590		10.2945	0.2450	8	0.0417	
9	-0.0131		10.3039	0.3264	9	-0.0879	
10	-0.2641		14.2712	0.1610	10	-0.3402	
11	-0.1947		16.4995	0.1236	11	-0.0698	
12	0.0269		16.5437	0.1676	12	0.0171	
13	0.0407		16.6478	0.2159	13	-0.0830	
14	-0.0991		17.2895	0.2411	14	-0.1685	
15	0.2481		21.4621	0.1227	15	0.2828	
16	0.3474		29.9729	0.0181*	16	0.0597	
17	0.2209		33.5579	0.0096*	17	0.0305	
18	-0.0036		33.5589	0.0143*	18	0.0367	
19	-0.0780		34.0466	0.0181*	19	-0.0934	
20	-0.1373		35.6291	0.0170*	20	-0.1076	
21	-0.1170		36.8350	0.0176*	21	-0.0322	
22	-0.1154		38.0701	0.0180*	22	0.0599	
23	-0.1113		39.2832	0.0185*	23	-0.1151	
24	-0.0297		39.3749	0.0249*	24	-0.1467	
25	-0.0352		39.5112	0.0327*	25	-0.0027	

Singapore

Model: I(1)

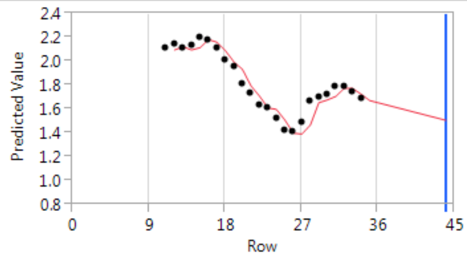
Model Summary

DF	22	Stable	Yes
Sum of Squared Errors	0.12468523	Invertible	Yes
Variance Estimate	0.00566751		
Standard Deviation	0.07528287		
Akaike's 'A' Information Criterion	-52.73034		
Schwarz's Bayesian Criterion	-51.594846		
RSquare	0.90952117		
RSquare Adj	0.90952117		
MAPE	3.37838394		
MAE	0.05884272		
-2LogLikelihood	-54.73034		

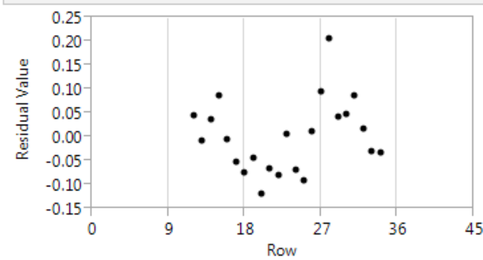
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0184174	0.0153513	-1.20	0.2430	-0.0184174

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.5597		8.1875	0.0042*	1	0.5597	
2	0.2642		10.0983	0.0064*	2	-0.0715	
3	0.1261		10.5555	0.0144*	3	0.0112	
4	0.0688		10.6987	0.0302*	4	0.0109	
5	-0.1212		11.1680	0.0481*	5	-0.2344	
6	-0.3913		16.3481	0.0120*	6	-0.3411	
7	-0.3162		19.9418	0.0057*	7	0.1216	
8	-0.2936		23.2457	0.0031*	8	-0.1674	
9	-0.2743		26.3355	0.0018*	9	-0.0679	
10	-0.3768		32.6144	0.0003*	10	-0.2454	
11	-0.2203		34.9400	0.0003*	11	0.0754	
12	-0.0118		34.9472	0.0005*	12	-0.0138	
13	0.1036		35.5643	0.0007*	13	0.0946	
14	0.0824		35.9977	0.0010*	14	-0.1565	
15	0.0858		36.5270	0.0015*	15	-0.0115	
16	0.1787		39.1488	0.0010*	16	-0.1067	
17	0.0647		39.5503	0.0015*	17	-0.1651	
18	-0.0028		39.5512	0.0024*	18	-0.0470	
19	-0.0024		39.5521	0.0037*	19	0.0816	
20	-0.0024		39.5532	0.0057*	20	-0.2129	
21	-0.0084		39.5733	0.0084*	21	0.0734	
22	-0.0124		39.6621	0.0118*	22	0.0413	
23	0.0000		.	.	23	-0.0599	
24	0.0000		.	.	24	-0.0697	
25	0.0000		.	.	25	0.0013	

Model: I(1)

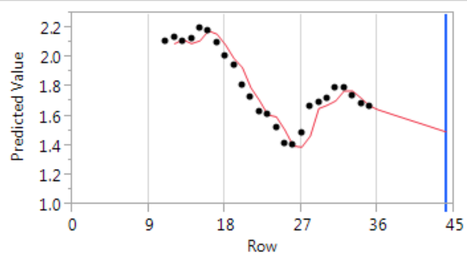
Model Summary

DF	23	Stable	Yes
Sum of Squared Errors	0.12474478	Invertible	Yes
Variance Estimate	0.00542369		
Standard Deviation	0.07364568		
Akaike's 'A' Information Criterion	-56.119892		
Schwarz's Bayesian Criterion	-54.941838		
RSquare	0.91075802		
RSquare Adj	0.91075802		
MAPE	3.25597316		
MAE	0.05669201		
-2LogLikelihood	-58.119892		

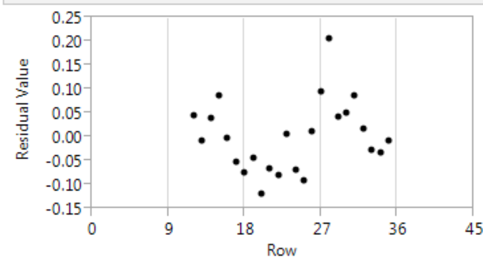
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0187458	0.0147160	-1.27	0.2154	-0.0187458

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.5615	8.5530	0.0034*	1	0.5615
2	0.2659	10.5584	0.0051*	2	-0.0721
3	0.1250	11.0226	0.0116*	3	0.0079
4	0.0630	11.1465	0.0250*	4	0.0054
5	-0.1247	11.6573	0.0398*	5	-0.2311
6	-0.3943	17.0463	0.0091*	6	-0.3433
7	-0.3294	21.0301	0.0037*	7	0.1045
8	-0.3002	24.5454	0.0019*	8	-0.1534
9	-0.2756	27.7062	0.0011*	9	-0.0706
10	-0.3714	33.8548	0.0002*	10	-0.2432
11	-0.2160	36.0935	0.0002*	11	0.0754
12	-0.0121	36.1011	0.0003*	12	-0.0234
13	0.1088	36.7725	0.0004*	13	0.0904
14	0.0872	37.2465	0.0007*	14	-0.1539
15	0.0941	37.8600	0.0009*	15	-0.0068
16	0.1822	40.4482	0.0007*	16	-0.1060
17	0.0698	40.8823	0.0010*	17	-0.1687
18	0.0011	40.8824	0.0016*	18	-0.0522
19	-0.0017	40.8827	0.0025*	19	0.0821
20	-0.0076	40.8917	0.0038*	20	-0.2153
21	-0.0107	40.9156	0.0057*	21	0.0782
22	-0.0119	40.9598	0.0083*	22	0.0352
23	-0.0028	40.9645	0.0120*	23	-0.0571
24	0.0000	.	.	24	-0.0759
25	0.0000	.	.	25	0.0082

Model: I(1)

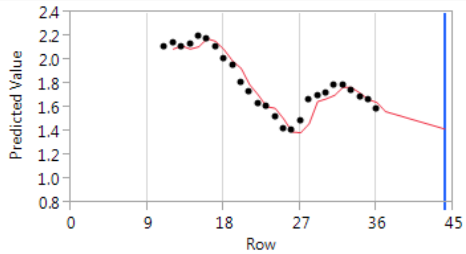
Model Summary

DF	24	Stable	Yes
Sum of Squared Errors	0.12785881	Invertible	Yes
Variance Estimate	0.00532745		
Standard Deviation	0.07298938		
Akaike's 'A' Information Criterion	-58.945687		
Schwarz's Bayesian Criterion	-57.726811		
RSquare	0.9113026		
RSquare Adj	0.9113026		
MAPE	3.25422348		
MAE	0.05642912		
-2LogLikelihood	-60.945687		

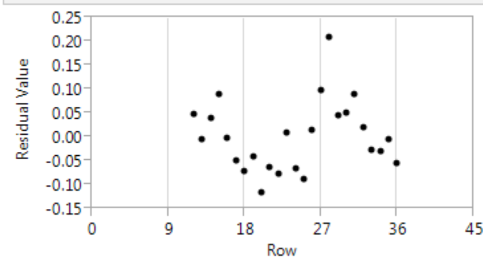
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0210240	0.0143031	-1.47	0.1546	-0.021024

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.5503	8.5175	0.0035*	1	0.5503
2	0.2739	10.7198	0.0047*	2	-0.0415
3	0.1342	11.2724	0.0103*	3	0.0000
4	0.0523	11.3604	0.0228*	4	-0.0191
5	-0.1624	12.2502	0.0315*	5	-0.2576
6	-0.4090	18.1940	0.0058*	6	-0.3205
7	-0.3422	22.5865	0.0020*	7	0.0655
8	-0.3866	28.5219	0.0004*	8	-0.2536
9	-0.3149	32.7044	0.0002*	9	0.0173
10	-0.3720	38.9305	<.0001*	10	-0.2664
11	-0.1731	40.3753	<.0001*	11	0.0912
12	0.0175	40.3911	<.0001*	12	-0.0156
13	0.1046	41.0061	<.0001*	13	0.0162
14	0.1229	41.9336	0.0001*	14	-0.1490
15	0.1247	42.9837	0.0002*	15	-0.0294
16	0.2336	47.0750	<.0001*	16	-0.0757
17	0.0887	47.7391	<.0001*	17	-0.1688
18	0.0352	47.8586	0.0002*	18	-0.0760
19	0.0240	47.9232	0.0003*	19	0.0346
20	-0.0046	47.9261	0.0004*	20	-0.1853
21	-0.0484	48.3214	0.0006*	21	0.0257
22	-0.0287	48.5070	0.0009*	22	0.0814
23	0.0005	48.5071	0.0014*	23	-0.1081
24	-0.0205	48.7894	0.0020*	24	-0.0220
25	0.0000	.	.	25	-0.0603

Model: I(1)

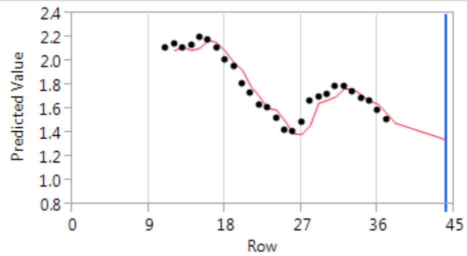
Model Summary

DF	25	Stable	Yes
Sum of Squared Errors	0.13139878	Invertible	Yes
Variance Estimate	0.00525595		
Standard Deviation	0.07249794		
Akaike's 'A' Information Criterion	-61.693185		
Schwarz's Bayesian Criterion	-60.435089		
RSquare	0.91357857		
RSquare Adj	0.91357857		
MAPE	3.26595755		
MAE	0.05629172		
-2LogLikelihood	-63.693185		

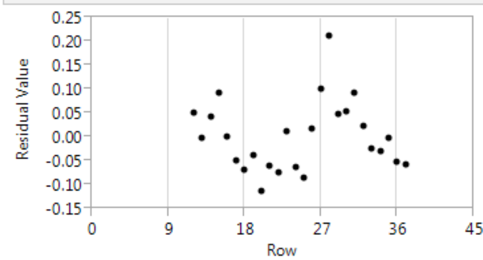
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0233577	0.0139414	-1.68	0.1063	-0.0233577

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.5598	9.1270	0.0025*	1	0.5598
2	0.2691	11.3241	0.0035*	2	-0.0645
3	0.1447	11.9869	0.0074*	3	0.0299
4	0.0617	12.1130	0.0165*	4	-0.0283
5	-0.1678	13.0892	0.0226*	5	-0.2773
6	-0.4397	20.1266	0.0026*	6	-0.3513
7	-0.3575	25.0228	0.0008*	7	0.0956
8	-0.3976	31.4179	0.0001*	8	-0.2856
9	-0.4021	38.3420	<.0001*	9	-0.0959
10	-0.4091	45.9566	<.0001*	10	-0.1895
11	-0.1777	47.4897	<.0001*	11	0.0679
12	0.0550	47.6469	<.0001*	12	0.0218
13	0.1323	48.6267	<.0001*	13	0.0442
14	0.1184	49.4772	<.0001*	14	-0.2500
15	0.1591	51.1527	<.0001*	15	-0.0377
16	0.2583	56.0084	<.0001*	16	-0.0906
17	0.1390	57.5716	<.0001*	17	-0.1636
18	0.0533	57.8306	<.0001*	18	-0.0884
19	0.0562	58.1591	<.0001*	19	0.0247
20	0.0187	58.2016	<.0001*	20	-0.2255
21	-0.0463	58.5142	<.0001*	21	0.0641
22	-0.0686	59.3718	<.0001*	22	0.0254
23	-0.0185	59.4550	<.0001*	23	-0.0661
24	-0.0184	59.5784	<.0001*	24	-0.1006
25	-0.0223	59.9394	0.0001*	25	-0.0122

Model: I(1)

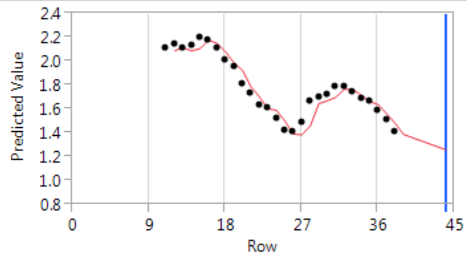
Model Summary

DF	26	Stable	Yes
Sum of Squared Errors	0.13600238	Invertible	Yes
Variance Estimate	0.00523086		
Standard Deviation	0.07232469		
Akaike's 'A' Information Criterion	-64.232153		
Schwarz's Bayesian Criterion	-62.936316		
RSquare	0.9176161		
RSquare Adj	0.9176161		
MAPE	3.30624181		
MAE	0.05648313		
-2LogLikelihood	-66.232153		

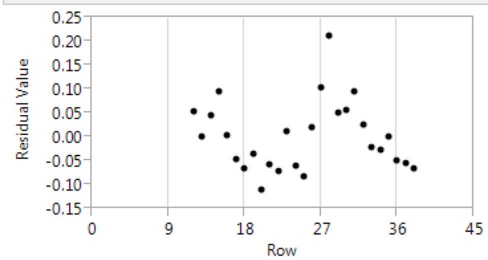
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0259185	0.0136589	-1.90	0.0689	-0.0259185

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.5696	9.7695	0.0018*	1	0.5696
2	0.2868	12.3450	0.0021*	2	-0.0557
3	0.1416	12.9988	0.0046*	3	0.0013
4	0.0731	13.1808	0.0104*	4	0.0051
5	-0.1506	13.9881	0.0157*	5	-0.2807
6	-0.4352	21.0499	0.0018*	6	-0.3671
7	-0.3906	27.0225	0.0003*	7	0.0637
8	-0.4111	33.9859	<.0001*	8	-0.2465
9	-0.4107	41.3238	<.0001*	9	-0.1379
10	-0.5004	52.8566	<.0001*	10	-0.3106
11	-0.2231	55.2926	<.0001*	11	0.1716
12	0.0417	55.3835	<.0001*	12	0.0086
13	0.1698	56.9957	<.0001*	13	0.0761
14	0.1484	58.3217	<.0001*	14	-0.2103
15	0.1506	59.8015	<.0001*	15	-0.1457
16	0.2877	65.6917	<.0001*	16	-0.1091
17	0.1629	67.7684	<.0001*	17	-0.2001
18	0.1071	68.7658	<.0001*	18	-0.0634
19	0.0726	69.2811	<.0001*	19	0.0131
20	0.0507	69.5690	<.0001*	20	-0.2400
21	-0.0215	69.6294	<.0001*	21	0.0278
22	-0.0670	70.3334	<.0001*	22	0.0962
23	-0.0643	71.1424	<.0001*	23	-0.0984
24	-0.0409	71.5787	<.0001*	24	-0.0717
25	-0.0211	71.7537	<.0001*	25	-0.1415

Model: I(1)

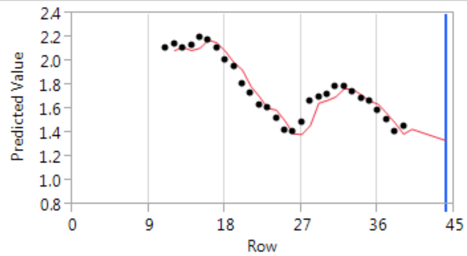
Model Summary

DF	27	Stable	Yes
Sum of Squared Errors	0.14023067	Invertible	Yes
Variance Estimate	0.00519373		
Standard Deviation	0.07206753		
Akaike's 'A' Information Criterion	-66.846232		
Schwarz's Bayesian Criterion	-65.514028		
RSquare	0.91968199		
RSquare Adj	0.91968199		
MAPE	3.36265691		
MAE	0.05699974		
-2LogLikelihood	-68.846232		

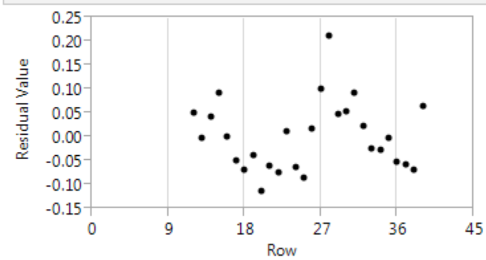
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0235536	0.0133733	-1.76	0.0895	-0.0235536

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.5218	8.4707	0.0036*	1	0.5218
2	0.2514	10.5133	0.0052*	2	-0.0286
3	0.1132	10.9441	0.0120*	3	-0.0093
4	0.0709	11.1200	0.0252*	4	0.0288
5	-0.1586	12.0381	0.0343*	5	-0.2792
6	-0.4336	19.2155	0.0038*	6	-0.3595
7	-0.3703	24.6990	0.0009*	7	0.0350
8	-0.3572	30.0584	0.0002*	8	-0.1818
9	-0.3752	36.2826	<.0001*	9	-0.1837
10	-0.4656	46.3985	<.0001*	10	-0.2781
11	-0.1199	47.1084	<.0001*	11	0.2380
12	0.0884	47.5189	<.0001*	12	-0.0406
13	0.1741	49.2170	<.0001*	13	0.0278
14	0.1035	49.8591	<.0001*	14	-0.1836
15	0.1149	50.7121	<.0001*	15	-0.2104
16	0.2837	56.3468	<.0001*	16	0.0133
17	0.1262	57.5621	<.0001*	17	-0.1834
18	0.0781	58.0746	<.0001*	18	-0.0151
19	0.0197	58.1109	<.0001*	19	-0.0690
20	0.0339	58.2313	<.0001*	20	-0.1683
21	-0.0508	58.5412	<.0001*	21	0.0289
22	-0.0870	59.6004	<.0001*	22	0.0564
23	-0.0621	60.2475	<.0001*	23	-0.0954
24	0.0035	60.2501	<.0001*	24	-0.0635
25	0.0001	60.2501	<.0001*	25	-0.1529

Model: I(1)

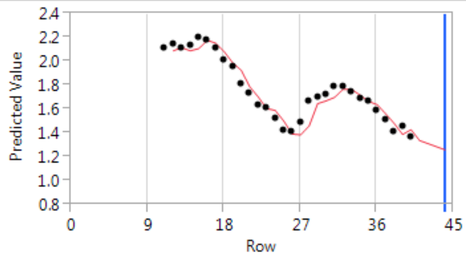
Model Summary

DF	28	Stable	Yes
Sum of Squared Errors	0.14467508	Invertible	Yes
Variance Estimate	0.00516697		
Standard Deviation	0.07188162		
Akaike's 'A' Information Criterion	-69.417826		
Schwarz's Bayesian Criterion	-68.05053		
RSquare	0.9236948		
RSquare Adj	0.9236948		
MAPE	3.40109755		
MAE	0.05713175		
-2LogLikelihood	-71.417826		

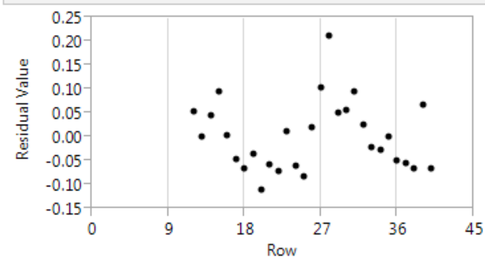
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0258931	0.0131159	-1.97	0.0583	-0.0258931

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.4750	7.2433	0.0071*	1	0.4750
2	0.2742	9.7464	0.0076*	2	0.0627
3	0.1355	10.3817	0.0156*	3	-0.0211
4	0.0911	10.6801	0.0304*	4	0.0270
5	-0.1537	11.5646	0.0413*	5	-0.2695
6	-0.4071	18.0410	0.0061*	6	-0.3545
7	-0.3464	22.9440	0.0017*	7	-0.0095
8	-0.3542	28.3147	0.0004*	8	-0.1410
9	-0.4031	35.6187	<.0001*	9	-0.2096
10	-0.4734	46.2205	<.0001*	10	-0.2609
11	-0.1347	47.1261	<.0001*	11	0.1688
12	-0.0104	47.1318	<.0001*	12	-0.0743
13	0.1222	47.9711	<.0001*	13	0.0708
14	0.0923	48.4816	<.0001*	14	-0.1268
15	0.1513	49.9508	<.0001*	15	-0.2231
16	0.3043	56.3541	<.0001*	16	0.0401
17	0.1141	57.3302	<.0001*	17	-0.2443
18	0.1066	58.2597	<.0001*	18	-0.0725
19	0.0439	58.4327	<.0001*	19	-0.1053
20	0.0817	59.0999	<.0001*	20	-0.0972
21	-0.0343	59.2320	<.0001*	21	-0.0266
22	-0.0541	59.6079	<.0001*	22	0.0279
23	-0.0379	59.8229	<.0001*	23	-0.0268
24	0.0031	59.8246	<.0001*	24	-0.0900
25	-0.0419	60.2197	<.0001*	25	-0.1251

Model: I(1)

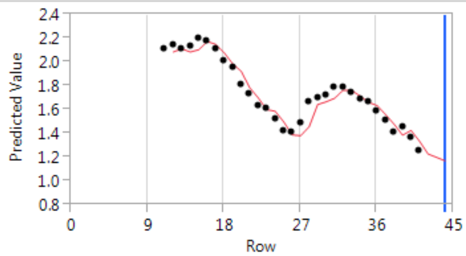
Model Summary

DF	29	Stable	Yes
Sum of Squared Errors	0.15094039	Invertible	Yes
Variance Estimate	0.00520484		
Standard Deviation	0.07214459		
Akaike's 'A' Information Criterion	-71.625717		
Schwarz's Bayesian Criterion	-70.22452		
RSquare	0.92897951		
RSquare Adj	0.92897951		
MAPE	3.48945035		
MAE	0.05781667		
-2LogLikelihood	-73.625717		

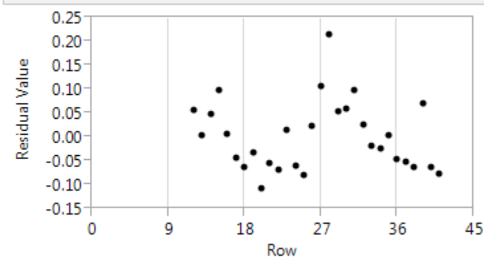
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0285767	0.0129504	-2.21	0.0354*	-0.0285767

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.4892	7.9226	0.0049*	1	0.4892
2	0.2276	9.6994	0.0078*	2	-0.0154
3	0.1636	10.6507	0.0138*	3	0.0763
4	0.1147	11.1362	0.0251*	4	0.0106
5	-0.1222	11.7101	0.0390*	5	-0.2540
6	-0.3898	17.7877	0.0068*	6	-0.3409
7	-0.3164	21.9668	0.0026*	7	0.0041
8	-0.3254	26.5872	0.0008*	8	-0.1675
9	-0.3943	33.6950	0.0001*	9	-0.1682
10	-0.4985	45.6236	<.0001*	10	-0.2994
11	-0.1540	46.8213	<.0001*	11	0.2197
12	-0.0324	46.8774	<.0001*	12	-0.1416
13	0.0077	46.8807	<.0001*	13	0.0304
14	0.0358	46.9574	<.0001*	14	-0.1278
15	0.1342	48.1107	<.0001*	15	-0.1062
16	0.3338	55.7526	<.0001*	16	0.0599
17	0.1375	57.1482	<.0001*	17	-0.2133
18	0.0906	57.8052	<.0001*	18	-0.1092
19	0.0747	58.2922	<.0001*	19	-0.1502
20	0.1032	59.3148	<.0001*	20	-0.0979
21	0.0206	59.3603	<.0001*	21	0.0634
22	-0.0363	59.5183	<.0001*	22	-0.0344
23	-0.0034	59.5199	<.0001*	23	-0.0290
24	0.0262	59.6301	<.0001*	24	0.0025
25	-0.0419	59.9663	0.0001*	25	-0.1536

Model: I(1)

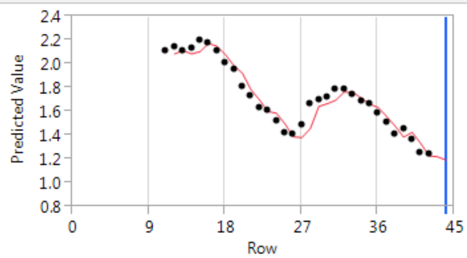
Model Summary

DF	30	Stable	Yes
Sum of Squared Errors	0.15137849	Invertible	Yes
Variance Estimate	0.00504595		
Standard Deviation	0.07103485		
Akaike's 'A' Information Criterion	-75.006548		
Schwarz's Bayesian Criterion	-73.57256		
RSquare	0.93548809		
RSquare Adj	0.93548809		
MAPE	3.43180165		
MAE	0.05661582		
-2LogLikelihood	-77.006548		

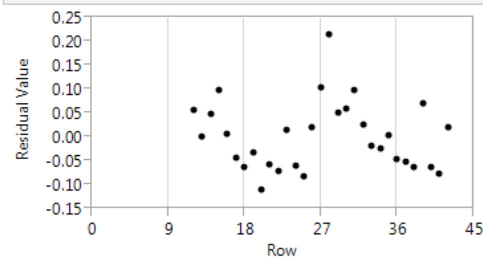
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	-0.0278903	0.0125508	-2.22	0.0340*	-0.0278903

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.4771		7.7622	0.0053*	1	0.4771	
2	0.2181		9.4395	0.0089*	2	-0.0124	
3	0.1726		10.5280	0.0146*	3	0.0948	
4	0.1059		10.9532	0.0271*	4	-0.0133	
5	-0.1290		11.6084	0.0406*	5	-0.2431	
6	-0.3954		18.0067	0.0062*	6	-0.3492	
7	-0.3158		22.2585	0.0023*	7	-0.0063	
8	-0.3286		27.0621	0.0007*	8	-0.1682	
9	-0.3973		34.4013	<.0001*	9	-0.1582	
10	-0.4951		46.3423	<.0001*	10	-0.3158	
11	-0.1419		47.3721	<.0001*	11	0.2219	
12	-0.0256		47.4072	<.0001*	12	-0.1508	
13	0.0134		47.4175	<.0001*	13	0.0594	
14	0.0643		47.6662	<.0001*	14	-0.1384	
15	0.1480		49.0664	<.0001*	15	-0.0985	
16	0.3363		56.7801	<.0001*	16	0.0311	
17	0.1271		57.9599	<.0001*	17	-0.2169	
18	0.0833		58.5062	<.0001*	18	-0.1253	
19	0.0779		59.0239	<.0001*	19	-0.1480	
20	0.0949		59.8610	<.0001*	20	-0.0917	
21	0.0143		59.8819	<.0001*	21	0.0631	
22	-0.0502		60.1685	<.0001*	22	-0.0548	
23	-0.0075		60.1757	<.0001*	23	-0.0160	
24	0.0177		60.2215	<.0001*	24	-0.0027	
25	-0.0479		60.6119	<.0001*	25	-0.1679	

South Korea

Model: I(1)

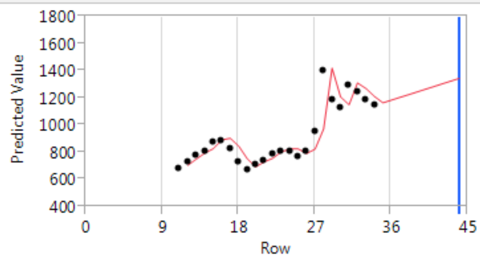
Model Summary

DF	22	Stable	Yes
Sum of Squared Errors	325699.712	Invertible	Yes
Variance Estimate	14804.5324		
Standard Deviation	121.673877		
Akaike's 'A' Information Criterion	287.110621		
Schwarz's Bayesian Criterion	288.246115		
RSquare	0.69072007		
RSquare Adj	0.69072007		
MAPE	7.26194213		
MAE	75.4146605		
-2LogLikelihood	285.110621		

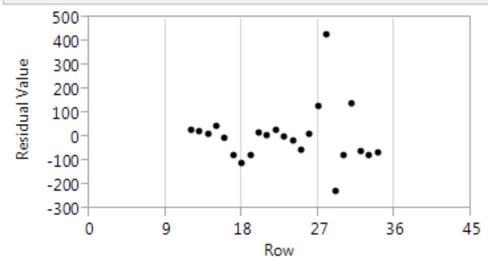
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	19.963609	24.80775	0.80	0.4296	19.9636085

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	-0.0461	0.0555	0.8138	1	-0.0461
2	-0.2986	2.4970	0.2869	2	-0.3014
3	0.0694	2.6353	0.4513	3	0.0414
4	0.0232	2.6516	0.6177	4	-0.0671
5	-0.0556	2.7505	0.7384	5	-0.0268
6	-0.0953	3.0577	0.8016	6	-0.1268
7	-0.0138	3.0645	0.8790	7	-0.0513
8	0.0057	3.0658	0.9302	8	-0.0677
9	-0.1367	3.8328	0.9221	9	-0.1738
10	-0.1295	4.5750	0.9177	10	-0.2025
11	-0.0100	4.5798	0.9498	11	-0.1774
12	0.0396	4.6618	0.9683	12	-0.1255
13	0.0459	4.7828	0.9797	13	-0.0701
14	-0.0005	4.7828	0.9886	14	-0.1012
15	0.0774	5.2131	0.9902	15	-0.0163
16	0.0765	5.6940	0.9911	16	-0.0251
17	-0.0095	5.7027	0.9950	17	-0.0425
18	-0.0072	5.7086	0.9972	18	-0.0659
19	-0.0053	5.7127	0.9985	19	-0.1089
20	-0.0131	5.7458	0.9992	20	-0.1237
21	-0.0112	5.7817	0.9996	21	-0.1152
22	-0.0053	5.7979	0.9998	22	-0.0883
23	0.0000	.	.	23	-0.0735
24	0.0000	.	.	24	-0.0480
25	0.0000	.	.	25	-0.0261

Model: I(1)

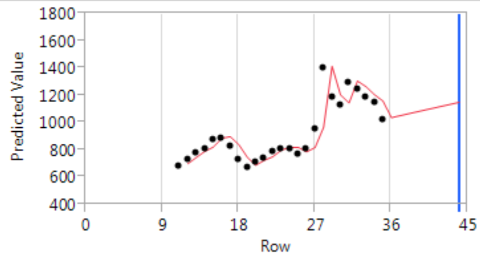
Model Summary

DF	23	Stable	Yes
Sum of Squared Errors	344874.363	Invertible	Yes
Variance Estimate	14994.5375		
Standard Deviation	122.452185		
Akaike's 'A' Information Criterion	299.858209		
Schwarz's Bayesian Criterion	301.036263		
RSquare	0.67536967		
RSquare Adj	0.67536967		
MAPE	7.56369291		
MAE	78.1661667		
-2LogLikelihood	297.858209		

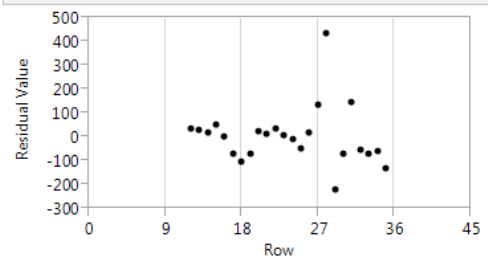
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	14.069825	24.46378	0.58	0.5708	14.0698245

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	-0.0166		0.0075	0.9309	1	-0.0166	
2	-0.2499		1.7782	0.4110	2	-0.2502	
3	0.0919		2.0292	0.5664	3	0.0881	
4	-0.0346		2.0666	0.7235	4	-0.1025	
5	-0.0213		2.0814	0.8378	5	0.0267	
6	0.0061		2.0827	0.9119	6	-0.0405	
7	-0.1810		3.2847	0.8575	7	-0.1819	
8	-0.0460		3.3671	0.9093	8	-0.0620	
9	-0.1355		4.1305	0.9026	9	-0.2607	
10	-0.1019		4.5930	0.9167	10	-0.1293	
11	-0.0031		4.5934	0.9492	11	-0.1729	
12	0.0357		4.6598	0.9684	12	-0.0460	
13	0.0309		4.7138	0.9810	13	-0.0581	
14	-0.0036		4.7146	0.9894	14	-0.0962	
15	0.0652		5.0094	0.9920	15	0.0014	
16	0.1016		5.8140	0.9900	16	-0.0336	
17	0.0271		5.8796	0.9940	17	-0.0222	
18	0.0215		5.9275	0.9965	18	-0.0602	
19	-0.0032		5.9288	0.9981	19	-0.0741	
20	-0.0344		6.1135	0.9987	20	-0.0932	
21	-0.0190		6.1884	0.9993	21	-0.0950	
22	-0.0174		6.2831	0.9996	22	-0.0587	
23	-0.0125		6.3806	0.9998	23	-0.0488	
24	0.0000		.	.	24	-0.0122	
25	0.0000		.	.	25	0.0056	

Model: I(1)

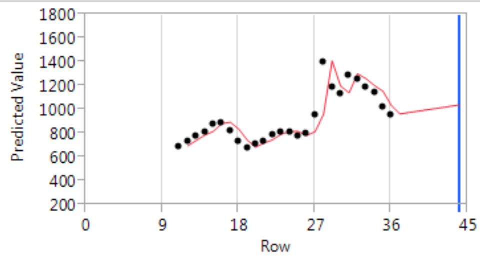
Model Summary

DF	24	Stable	Yes
Sum of Squared Errors	351567.406	Invertible	Yes
Variance Estimate	14648.6419		
Standard Deviation	121.031574		
Akaike's 'A' Information Criterion	311.72895		
Schwarz's Bayesian Criterion	312.947825		
RSquare	0.6692537		
RSquare Adj	0.6692537		
MAPE	7.62554249		
MAE	78.3594678		
-2LogLikelihood	309.72895		

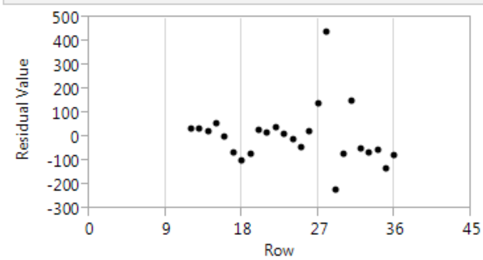
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	10.729904	23.72005	0.45	0.6551	10.729904

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0155	0.0068	0.9343	1	0.0155
2	-0.2300	1.5592	0.4586	2	-0.2303
3	0.1083	1.9193	0.5893	3	0.1229
4	-0.0195	1.9316	0.7483	4	-0.0859
5	-0.0541	2.0303	0.8449	5	0.0054
6	0.0243	2.0512	0.9149	6	-0.0123
7	-0.1215	2.6050	0.9190	7	-0.1328
8	-0.1425	3.4116	0.9059	8	-0.1325
9	-0.1637	4.5415	0.8723	9	-0.2452
10	-0.1046	5.0338	0.8889	10	-0.1612
11	0.0075	5.0365	0.9294	11	-0.1035
12	0.0376	5.1099	0.9542	12	-0.0314
13	0.0283	5.1550	0.9716	13	-0.0055
14	-0.0115	5.1631	0.9834	14	-0.0655
15	0.0607	5.4115	0.9880	15	0.0095
16	0.0924	6.0522	0.9875	16	-0.0168
17	0.0381	6.1744	0.9919	17	-0.0380
18	0.0427	6.3504	0.9946	18	-0.0394
19	0.0123	6.3675	0.9969	19	-0.0677
20	-0.0358	6.5406	0.9979	20	-0.0601
21	-0.0326	6.7197	0.9986	21	-0.0688
22	-0.0231	6.8400	0.9992	22	-0.0454
23	-0.0208	6.9864	0.9995	23	-0.0335
24	-0.0080	7.0297	0.9997	24	-0.0062
25	0.0000	.	.	25	0.0197

Model: I(1)

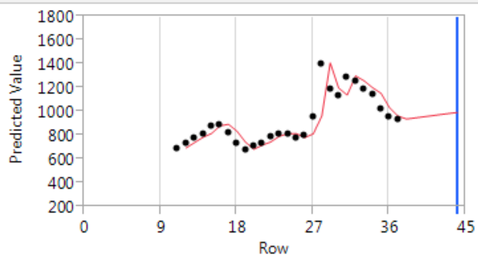
Model Summary

DF	25	Stable	Yes
Sum of Squared Errors	352819.049	Invertible	Yes
Variance Estimate	14112.762		
Standard Deviation	118.797146		
Akaike's 'A' Information Criterion	323.190769		
Schwarz's Bayesian Criterion	324.448866		
RSquare	0.66807688		
RSquare Adj	0.66807688		
MAPE	7.48857889		
MAE	76.7333038		
-2LogLikelihood	321.190769		

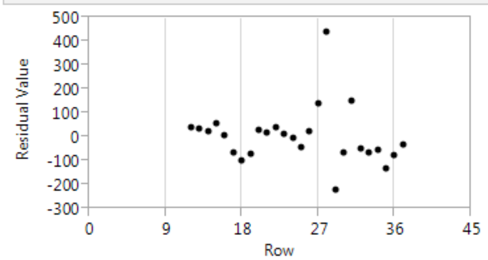
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	9.3422423	22.85857	0.41	0.6862	9.34224231

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0235	0.0161	0.8990	1	0.0235
2	-0.2156	1.4264	0.4901	2	-0.2163
3	0.1143	1.8400	0.6063	3	0.1318
4	-0.0119	1.8447	0.7643	4	-0.0737
5	-0.0478	1.9239	0.8596	5	0.0119
6	0.0100	1.9275	0.9262	6	-0.0234
7	-0.1130	2.4164	0.9333	7	-0.1191
8	-0.1178	2.9779	0.9357	8	-0.1104
9	-0.2054	4.7843	0.8527	9	-0.2735
10	-0.1177	5.4150	0.8618	10	-0.1502
11	0.0051	5.4163	0.9093	11	-0.1150
12	0.0418	5.5071	0.9389	12	0.0031
13	0.0291	5.5545	0.9609	13	0.0033
14	-0.0124	5.5639	0.9763	14	-0.0449
15	0.0566	5.7762	0.9833	15	0.0192
16	0.0898	6.3638	0.9837	16	-0.0139
17	0.0328	6.4509	0.9896	17	-0.0379
18	0.0481	6.6619	0.9927	18	-0.0488
19	0.0216	6.7104	0.9956	19	-0.0666
20	-0.0300	6.8193	0.9972	20	-0.0577
21	-0.0335	6.9825	0.9982	21	-0.0568
22	-0.0292	7.1373	0.9988	22	-0.0349
23	-0.0235	7.2716	0.9992	23	-0.0298
24	-0.0116	7.3203	0.9996	24	-0.0038
25	-0.0036	7.3297	0.9998	25	0.0184

Model: I(1)

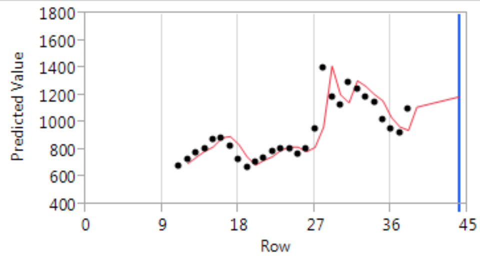
Model Summary

DF	26	Stable	Yes
Sum of Squared Errors	377591.892	Invertible	Yes
Variance Estimate	14522.7651		
Standard Deviation	120.510436		
Akaike's 'A' Information Criterion	336.357455		
Schwarz's Bayesian Criterion	337.653292		
RSquare	0.65365595		
RSquare Adj	0.65365595		
MAPE	7.72945476		
MAE	79.8437997		
-2LogLikelihood	334.357455		

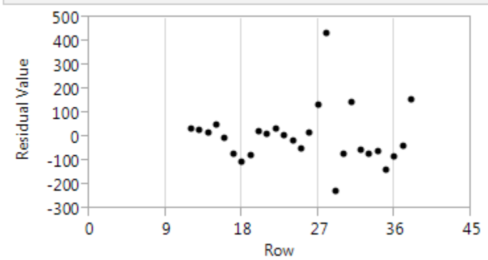
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	15.282693	22.75412	0.67	0.5077	15.2826926

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0077	0.0018	0.9661	1	0.0077
2	-0.2345	1.7248	0.4222	2	-0.2346
3	0.0507	1.8085	0.6131	3	0.0579
4	-0.0369	1.8548	0.7624	4	-0.0995
5	-0.0762	2.0612	0.8406	5	-0.0505
6	-0.0174	2.0725	0.9129	6	-0.0537
7	-0.0486	2.1649	0.9502	7	-0.0773
8	-0.1454	3.0363	0.9321	8	-0.1716
9	-0.2924	6.7549	0.6626	9	-0.3663
10	0.0656	6.9534	0.7298	10	-0.0491
11	0.0608	7.1345	0.7881	11	-0.1638
12	0.0481	7.2555	0.8403	12	0.0205
13	0.0082	7.2592	0.8883	13	-0.1425
14	-0.0171	7.2767	0.9235	14	-0.1080
15	0.0561	7.4818	0.9429	15	-0.0802
16	0.1008	8.2045	0.9425	16	-0.0438
17	0.0456	8.3673	0.9581	17	-0.0758
18	0.0611	8.6917	0.9665	18	-0.0703
19	-0.0056	8.6948	0.9782	19	-0.0179
20	-0.0659	9.1804	0.9807	20	-0.1029
21	-0.0576	9.6130	0.9835	21	-0.0664
22	-0.0258	9.7170	0.9887	22	-0.1475
23	0.0008	9.7171	0.9929	23	-0.0717
24	-0.0032	9.7198	0.9956	24	-0.0609
25	0.0085	9.7480	0.9973	25	0.0054

Model: I(1)

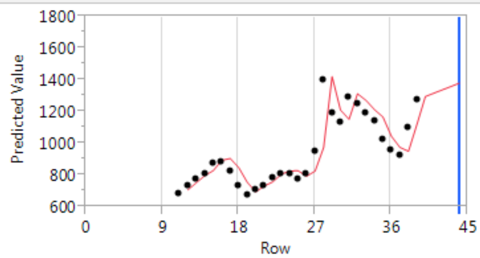
Model Summary

DF	27	Stable	Yes
Sum of Squared Errors	402474.374	Invertible	Yes
Variance Estimate	14906.4583		
Standard Deviation	122.092007		
Akaike's 'A' Information Criterion	349.509659		
Schwarz's Bayesian Criterion	350.841864		
RSquare	0.6647056		
RSquare Adj	0.6647056		
MAPE	7.88841582		
MAE	82.72925		
-2LogLikelihood	347.509659		

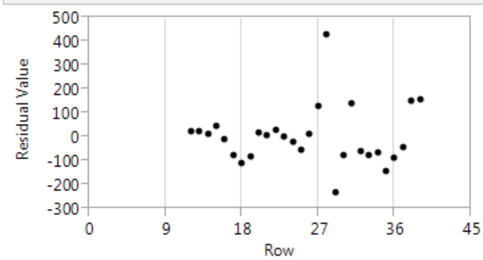
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	21.019707	22.66140	0.93	0.3619	21.0197071

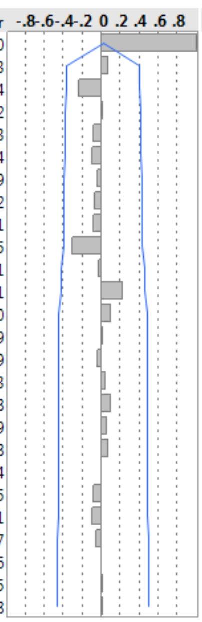
Forecast

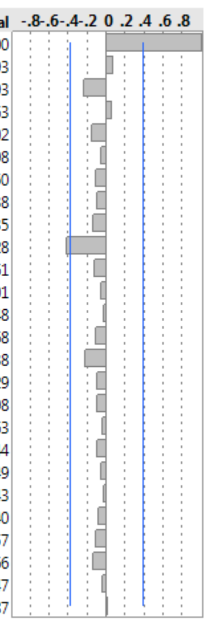


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0693	0.1492	0.6993	1	0.0693
2	-0.2334	1.9088	0.3850	2	-0.2393
3	0.0162	1.9176	0.5897	3	0.0563
4	-0.0873	2.1846	0.7019	4	-0.1602
5	-0.0964	2.5243	0.7728	5	-0.0598
6	-0.0479	2.6117	0.8558	6	-0.1050
7	-0.0732	2.8261	0.9006	7	-0.1038
8	-0.0851	3.1300	0.9259	8	-0.1335
9	-0.3085	7.3369	0.6021	9	-0.4128
10	-0.0341	7.3912	0.6881	10	-0.1261
11	0.2211	9.8068	0.5478	11	-0.0601
12	0.0960	10.2906	0.5905	12	-0.0348
13	0.0139	10.3013	0.6691	13	-0.1168
14	-0.0369	10.3830	0.7337	14	-0.2238
15	0.0453	10.5155	0.7861	15	-0.0929
16	0.0968	11.1710	0.7988	16	-0.0998
17	0.0619	11.4635	0.8315	17	-0.0463
18	0.0648	11.8167	0.8566	18	-0.1044
19	0.0054	11.8195	0.8932	19	-0.0549
20	-0.0875	12.6227	0.8930	20	-0.0243
21	-0.0941	13.6853	0.8827	21	-0.0840
22	-0.0537	14.0887	0.8983	22	-0.1157
23	-0.0026	14.0898	0.9243	23	-0.1466
24	0.0125	14.1226	0.9438	24	-0.0447
25	0.0098	14.1498	0.9591	25	0.0187





Model: I(1)

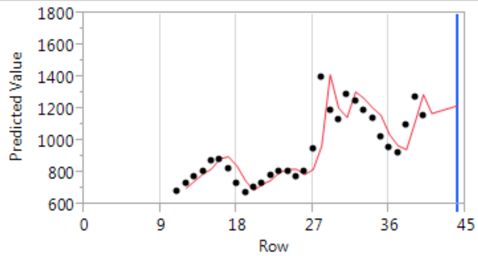
Model Summary

DF	28	Stable	Yes
Sum of Squared Errors	421373.11	Invertible	Yes
Variance Estimate	15049.0396		
Standard Deviation	122.674527		
Akaike's 'A' Information Criterion	362.233801		
Schwarz's Bayesian Criterion	363.601097		
RSquare	0.66065775		
RSquare Adj	0.66065775		
MAPE	8.0316774		
MAE	84.5345056		
-2LogLikelihood	360.233801		

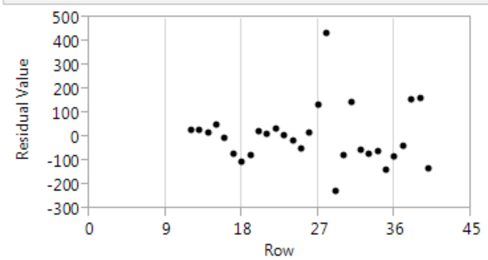
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	16.195362	22.39033	0.72	0.4755	16.1953621

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0144	0.0066	0.9351	1	0.0144
2	-0.2747	2.5195	0.2837	2	-0.2750
3	0.0265	2.5439	0.4674	3	0.0384
4	-0.0577	2.6637	0.6156	4	-0.1460
5	-0.0481	2.7502	0.7384	5	-0.0264
6	-0.0239	2.7726	0.8368	6	-0.0898
7	-0.0424	2.8460	0.8989	7	-0.0624
8	-0.0574	2.9870	0.9352	8	-0.1066
9	-0.3376	8.1114	0.5230	9	-0.4239
10	-0.0042	8.1123	0.6179	10	-0.0962
11	0.2904	12.3250	0.3397	11	0.0252
12	-0.0449	12.4315	0.4117	12	-0.1340
13	-0.0288	12.4780	0.4889	13	-0.0617
14	-0.0396	12.5722	0.5605	14	-0.2472
15	0.0606	12.8083	0.6171	15	-0.0084
16	0.0972	13.4614	0.6388	16	-0.1000
17	0.0525	13.6683	0.6904	17	-0.0117
18	0.0491	13.8649	0.7379	18	-0.1151
19	0.0001	13.8649	0.7915	19	-0.0422
20	-0.0938	14.7438	0.7909	20	0.0144
21	-0.0675	15.2555	0.8099	21	-0.1769
22	-0.0167	15.2913	0.8494	22	-0.1284
23	0.0231	15.3712	0.8808	23	-0.1340
24	0.0165	15.4204	0.9079	24	-0.0234
25	-0.0023	15.4216	0.9310	25	0.0289

Model: I(1)

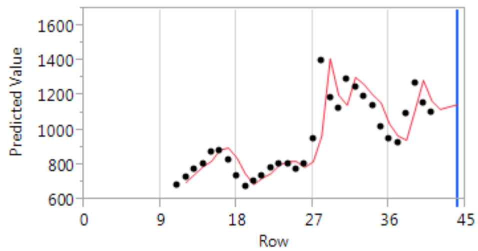
Model Summary

DF	29	Stable	Yes
Sum of Squared Errors	425456.555	Invertible	Yes
Variance Estimate	14670.9157		
Standard Deviation	121.123556		
Akaike's 'A' Information Criterion	373.927934		
Schwarz's Bayesian Criterion	375.329132		
RSquare	0.66335027		
RSquare Adj	0.66335027		
MAPE	7.95221542		
MAE	83.7387324		
-2LogLikelihood	371.927934		

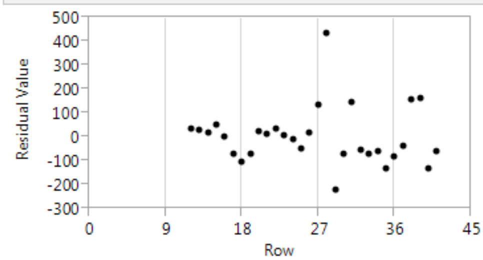
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	14.028887	21.74491	0.65	0.5239	14.0288867

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0347	0.0399	0.8417	1	0.0347
2	-0.2961	3.0461	0.2180	2	-0.2977
3	0.0023	3.0463	0.3845	3	0.0285
4	-0.0524	3.1476	0.5334	4	-0.1562
5	-0.0359	3.1970	0.6696	5	-0.0177
6	-0.0032	3.1975	0.7837	6	-0.0729
7	-0.0316	3.2392	0.8620	7	-0.0494
8	-0.0441	3.3240	0.9124	8	-0.0809
9	-0.3239	8.1199	0.5221	9	-0.4027
10	-0.0244	8.1486	0.6143	10	-0.0690
11	0.3001	12.6990	0.3135	11	0.0498
12	-0.0085	12.7028	0.3910	12	-0.0933
13	-0.0918	13.1785	0.4341	13	-0.0907
14	-0.0588	13.3862	0.4964	14	-0.2080
15	0.0574	13.5973	0.5563	15	0.0045
16	0.1030	14.3251	0.5745	16	-0.0495
17	0.0515	14.5206	0.6300	17	0.0070
18	0.0462	14.6912	0.6831	18	-0.0742
19	-0.0060	14.6943	0.7418	19	-0.0353
20	-0.0966	15.5908	0.7417	20	0.0330
21	-0.0719	16.1426	0.7616	21	-0.1404
22	-0.0066	16.1478	0.8085	22	-0.1302
23	0.0383	16.3491	0.8399	23	-0.0942
24	0.0280	16.4745	0.8702	24	0.0308
25	-0.0006	16.4746	0.9000	25	0.0619

Model: I(1)

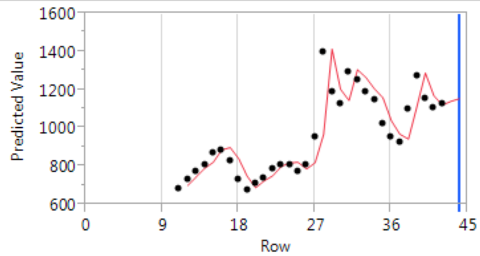
Model Summary

DF	30	Stable	Yes
Sum of Squared Errors	425482.655	Invertible	Yes
Variance Estimate	14182.7552		
Standard Deviation	119.091373		
Akaike's 'A' Information Criterion	385.310949		
Schwarz's Bayesian Criterion	386.744936		
RSquare	0.67022582		
RSquare Adj	0.67022582		
MAPE	7.71064606		
MAE	81.21041		
-2LogLikelihood	383.310949		

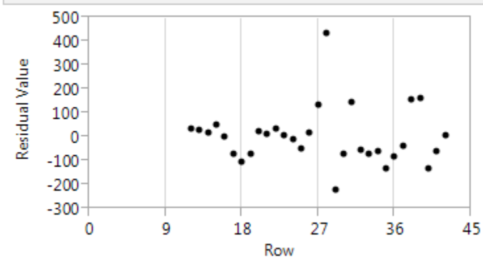
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	14.196410	21.03760	0.67	0.5050	14.1964097

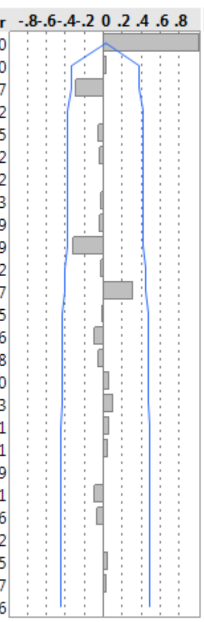
Forecast

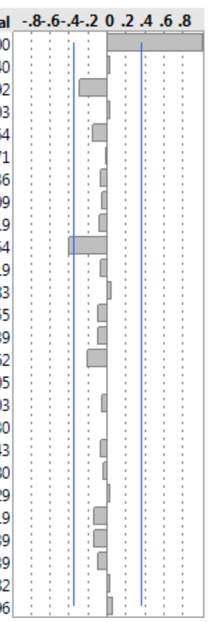


Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.0340	0.0393	0.8428	1	0.0340
2	-0.2977	3.1660	0.2054	2	-0.2992
3	0.0042	3.1666	0.3666	3	0.0303
4	-0.0505	3.2631	0.5148	4	-0.1554
5	-0.0362	3.3147	0.6516	5	-0.0171
6	-0.0042	3.3155	0.7683	6	-0.0736
7	-0.0333	3.3628	0.8495	7	-0.0509
8	-0.0449	3.4525	0.9028	8	-0.0819
9	-0.3249	8.3604	0.4983	9	-0.4054
10	-0.0252	8.3915	0.5907	10	-0.0719
11	0.3017	13.0481	0.2902	11	0.0483
12	-0.0095	13.0529	0.3652	12	-0.0955
13	-0.0946	13.5620	0.4054	13	-0.0939
14	-0.0538	13.7360	0.4696	14	-0.2062
15	0.0590	13.9586	0.5287	15	0.0005
16	0.1033	14.6863	0.5477	16	-0.0503
17	0.0511	14.8770	0.6043	17	0.0030
18	0.0461	15.0445	0.6589	18	-0.0743
19	-0.0059	15.0475	0.7196	19	-0.0380
20	-0.0961	15.9057	0.7225	20	0.0329
21	-0.0716	16.4307	0.7450	21	-0.1419
22	-0.0062	16.4350	0.7937	22	-0.1339
23	0.0375	16.6148	0.8277	23	-0.0939
24	0.0267	16.7193	0.8604	24	0.0282
25	-0.0016	16.7197	0.8917	25	0.0596





United Kingdom

Model: I(1)

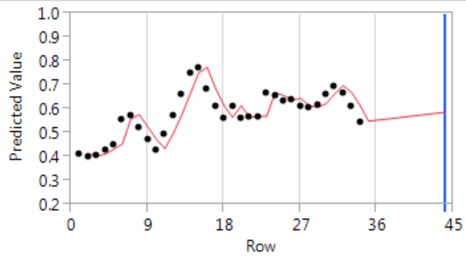
Model Summary

DF	32	Stable	Yes
Sum of Squared Errors	0.08789509	Invertible	Yes
Variance Estimate	0.00274672		
Standard Deviation	0.05240917		
Akaike's 'A' Information Criterion	-99.97798		
Schwarz's Bayesian Criterion	-98.481473		
RSquare	0.68996517		
RSquare Adj	0.68996517		
MAPE	7.21692271		
MAE	0.04221588		
-2LogLikelihood	-101.97798		

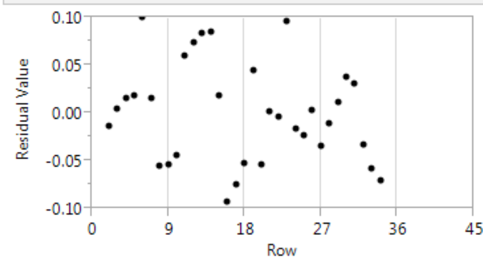
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	0.00413400	0.0089746	0.46	0.6482	0.004134

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3897	5.4808	0.0192*	1	0.3897
2	-0.0360	5.5290	0.0630	2	-0.2215
3	-0.4231	12.4195	0.0061*	3	-0.3963
4	-0.3615	17.6230	0.0015*	4	-0.0647
5	-0.2637	20.4907	0.0010*	5	-0.2002
6	-0.0675	20.6855	0.0021*	6	-0.1484
7	0.1953	22.3790	0.0022*	7	0.1264
8	0.3531	28.1394	0.0004*	8	0.1128
9	0.1616	29.3961	0.0006*	9	-0.1691
10	-0.0395	29.4744	0.0010*	10	0.0109
11	-0.1112	30.1239	0.0015*	11	0.1387
12	-0.0186	30.1428	0.0027*	12	0.1006
13	-0.1454	31.3641	0.0030*	13	-0.2164
14	-0.1846	33.4348	0.0025*	14	-0.1004
15	-0.0563	33.6385	0.0038*	15	0.0885
16	0.1839	35.9374	0.0030*	16	0.0854
17	0.3075	42.7635	0.0005*	17	0.1733
18	0.1282	44.0300	0.0006*	18	-0.0676
19	-0.0408	44.1676	0.0009*	19	-0.1021
20	-0.1533	46.2552	0.0007*	20	0.0122
21	-0.2439	51.9789	0.0002*	21	-0.0271
22	-0.1404	54.0484	0.0002*	22	0.1134
23	-0.0030	54.0495	0.0003*	23	-0.0535
24	0.1388	56.5216	0.0002*	24	-0.2078
25	0.1242	58.7487	0.0002*	25	-0.0483

Model: I(1)

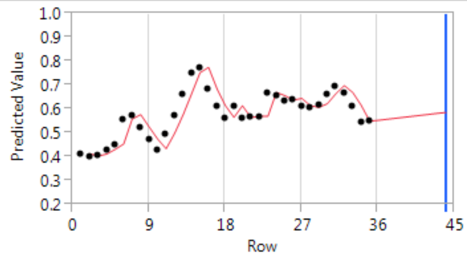
Model Summary

DF	33	Stable	Yes
Sum of Squared Errors	0.08789521	Invertible	Yes
Variance Estimate	0.00266349		
Standard Deviation	0.05160902		
Akaike's 'A' Information Criterion	-104.08317		
Schwarz's Bayesian Criterion	-102.55681		
RSquare	0.69115932		
RSquare Adj	0.69115932		
MAPE	7.00654636		
MAE	0.04098476		
-2LogLikelihood	-106.08317		

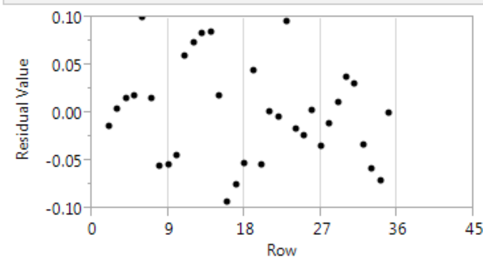
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	0.00412347	0.0087124	0.47	0.6391	0.00412347

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3900	5.6405	0.0176*	1	0.3900
2	-0.0357	5.6894	0.0582	2	-0.2215
3	-0.4229	12.7509	0.0052*	3	-0.3962
4	-0.3616	18.0846	0.0012*	4	-0.0646
5	-0.2638	21.0222	0.0008*	5	-0.2000
6	-0.0675	21.2215	0.0017*	6	-0.1481
7	0.1953	22.9506	0.0017*	7	0.1267
8	0.3533	28.8252	0.0003*	8	0.1130
9	0.1616	30.1038	0.0004*	9	-0.1693
10	-0.0394	30.1828	0.0008*	10	0.0112
11	-0.1112	30.8404	0.0012*	11	0.1389
12	-0.0189	30.8604	0.0021*	12	0.0998
13	-0.1454	32.0931	0.0023*	13	-0.2160
14	-0.1846	34.1785	0.0019*	14	-0.1003
15	-0.0561	34.3816	0.0030*	15	0.0884
16	0.1838	36.6779	0.0023*	16	0.0851
17	0.3077	43.4957	0.0004*	17	0.1740
18	0.1286	44.7600	0.0004*	18	-0.0677
19	-0.0405	44.8935	0.0007*	19	-0.1022
20	-0.1533	46.9490	0.0006*	20	0.0124
21	-0.2442	52.5626	0.0002*	21	-0.0271
22	-0.1407	54.5827	0.0001*	22	0.1134
23	-0.0033	54.5839	0.0002*	23	-0.0536
24	0.1385	56.9331	0.0002*	24	-0.2078
25	0.1244	59.0367	0.0001*	25	-0.0484

Model: I(1)

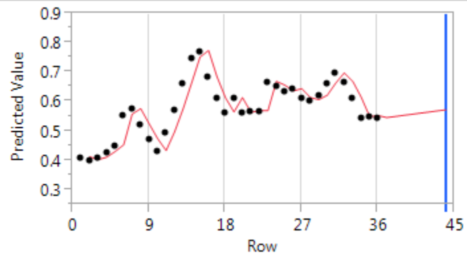
Model Summary

DF	34	Stable	Yes
Sum of Squared Errors	0.08801228	Invertible	Yes
Variance Estimate	0.0025886		
Standard Deviation	0.05087825		
Akaike's 'A' Information Criterion	-108.17125		
Schwarz's Bayesian Criterion	-106.6159		
RSquare	0.69238442		
RSquare Adj	0.69238442		
MAPE	6.86164846		
MAE	0.04011845		
-2LogLikelihood	-110.17125		

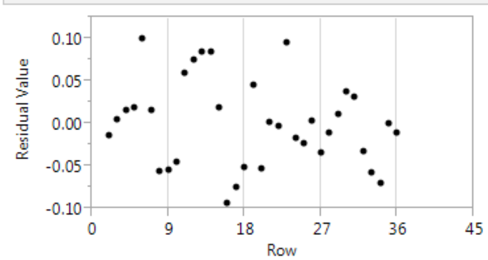
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	0.00380983	0.0084664	0.45	0.6556	0.00380983

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value
0	1.0000		.	.
1	0.3895		5.7795	0.0162*
2	-0.0269		5.8079	0.0548
3	-0.4149		12.7737	0.0052*
4	-0.3566		18.0851	0.0012*
5	-0.2672		21.1663	0.0008*
6	-0.0721		21.3986	0.0016*
7	0.1937		23.1342	0.0016*
8	0.3544		29.1578	0.0003*
9	0.1660		30.5309	0.0004*
10	-0.0394		30.6114	0.0007*
11	-0.1081		31.2416	0.0010*
12	-0.0170		31.2578	0.0018*
13	-0.1576		32.7201	0.0019*
14	-0.1847		34.8244	0.0016*
15	-0.0567		35.0327	0.0024*
16	0.1900		37.4938	0.0018*
17	0.3019		44.0489	0.0003*
18	0.1348		45.4323	0.0004*
19	-0.0308		45.5089	0.0006*
20	-0.1410		47.2252	0.0005*
21	-0.2454		52.7939	0.0001*
22	-0.1506		55.0547	0.0001*
23	-0.0136		55.0746	0.0002*
24	0.1291		57.0359	0.0002*
25	0.1164		58.7913	0.0002*

Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000	
1	0.3895	
2	-0.2106	
3	-0.3950	
4	-0.0617	
5	-0.1966	
6	-0.1412	
7	0.1361	
8	0.1169	
9	-0.1642	
10	0.0043	
11	0.1454	
12	0.1054	
13	-0.2398	
14	-0.0851	
15	0.0927	
16	0.0812	
17	0.1647	
18	-0.0505	
19	-0.1071	
20	0.0146	
21	-0.0159	
22	0.1094	
23	-0.0594	
24	-0.2133	
25	-0.0402	

Model: I(1)

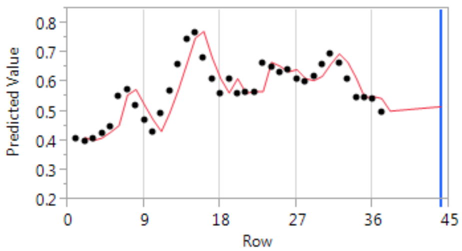
Model Summary

DF	35	Stable	Yes
Sum of Squared Errors	0.09014033	Invertible	Yes
Variance Estimate	0.00257544		
Standard Deviation	0.05074877		
Akaike's 'A' Information Criterion	-111.47306		
Schwarz's Bayesian Criterion	-109.88954		
RSquare	0.69187147		
RSquare Adj	0.69187147		
MAPE	6.9266179		
MAE	0.04030176		
-2LogLikelihood	-113.47306		

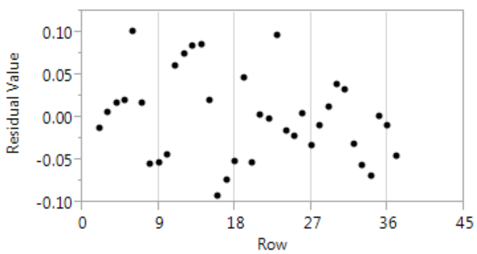
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	0.00251024	0.0083268	0.30	0.7648	0.00251024

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.3861		5.8252	0.0158*	1	0.3861	
2	-0.0260		5.8524	0.0536	2	-0.2057	
3	-0.3688		11.4896	0.0094*	3	-0.3402	
4	-0.3175		15.7998	0.0033*	4	-0.0577	
5	-0.2437		18.4207	0.0025*	5	-0.1793	
6	-0.0862		18.7595	0.0046*	6	-0.1179	
7	0.1703		20.1271	0.0053*	7	0.1447	
8	0.3411		25.8116	0.0011*	8	0.1406	
9	0.1692		27.2622	0.0013*	9	-0.1328	
10	-0.0203		27.2839	0.0023*	10	0.0147	
11	-0.1073		27.9137	0.0033*	11	0.0967	
12	-0.0058		27.9156	0.0057*	12	0.1306	
13	-0.1472		29.2051	0.0061*	13	-0.2038	
14	-0.2324		32.5636	0.0033*	14	-0.1756	
15	-0.0559		32.7668	0.0051*	15	0.1408	
16	0.1836		35.0727	0.0039*	16	0.0871	
17	0.3222		42.5458	0.0006*	17	0.1390	
18	0.1078		43.4285	0.0007*	18	-0.1042	
19	-0.0032		43.4293	0.0011*	19	-0.0037	
20	-0.0981		44.2521	0.0014*	20	0.0145	
21	-0.1896		47.5297	0.0008*	21	-0.0195	
22	-0.1554		49.8884	0.0006*	22	0.1101	
23	-0.0557		50.2144	0.0009*	23	-0.0752	
24	0.0831		51.0022	0.0011*	24	-0.1808	
25	0.0744		51.6913	0.0013*	25	-0.0707	

Model: I(1)

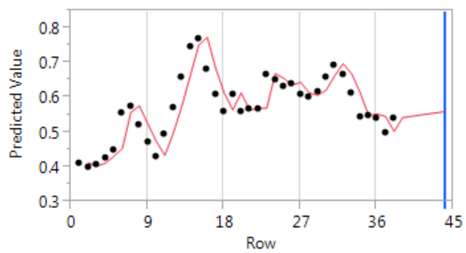
Model Summary

DF	36	Stable	Yes
Sum of Squared Errors	0.09148808	Invertible	Yes
Variance Estimate	0.00254134		
Standard Deviation	0.05041166		
Akaike's 'A' Information Criterion	-115.08973		
Schwarz's Bayesian Criterion	-113.47882		
RSquare	0.68886575		
RSquare Adj	0.68886575		
MAPE	6.9241261		
MAE	0.04019124		
-2LogLikelihood	-117.08973		

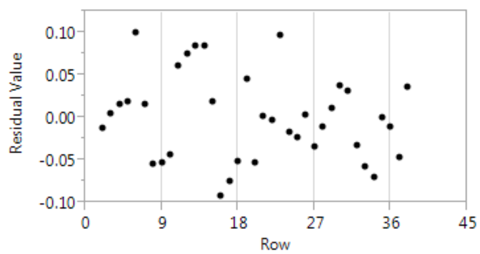
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	0.00351614	0.0081779	0.43	0.6698	0.00351614

Forecast



Residuals



Lag	AutoCorr	-.8-.6-.4-.2 0 .2 .4 .6 .8	Ljung-Box Q	p-Value	Lag	Partial	-.8-.6-.4-.2 0 .2 .4 .6 .8
0	1.0000		.	.	0	1.0000	
1	0.3617		5.2444	0.0220*	1	0.3617	
2	-0.0300		5.2816	0.0713	2	-0.1851	
3	-0.3633		10.8843	0.0124*	3	-0.3378	
4	-0.3411		15.9715	0.0031*	4	-0.1171	
5	-0.2630		19.0900	0.0018*	5	-0.1833	
6	-0.0982		19.5387	0.0033*	6	-0.1372	
7	0.1796		21.0895	0.0036*	7	0.1165	
8	0.3503		27.1966	0.0007*	8	0.1389	
9	0.1701		28.6884	0.0007*	9	-0.1297	
10	-0.0248		28.7212	0.0014*	10	-0.0183	
11	-0.1191		29.5084	0.0019*	11	0.0739	
12	-0.0034		29.5090	0.0033*	12	0.1724	
13	-0.1525		30.9076	0.0035*	13	-0.1956	
14	-0.2340		34.3420	0.0018*	14	-0.2102	
15	-0.0153		34.3572	0.0030*	15	0.1715	
16	0.1805		36.5952	0.0024*	16	0.0738	
17	0.3184		43.9098	0.0004*	17	0.1596	
18	0.0852		44.4615	0.0005*	18	-0.1063	
19	0.0150		44.4796	0.0008*	19	0.0219	
20	-0.1176		45.6542	0.0009*	20	-0.0457	
21	-0.2177		49.9302	0.0004*	21	-0.0110	
22	-0.1911		53.4429	0.0002*	22	0.0945	
23	-0.0484		53.6846	0.0003*	23	-0.0723	
24	0.1150		55.1528	0.0003*	24	-0.1705	
25	0.1071		56.5324	0.0003*	25	-0.0965	

Model: I(1)

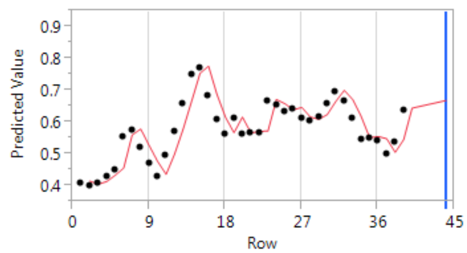
Model Summary

DF	37	Stable	Yes
Sum of Squared Errors	0.10042118	Invertible	Yes
Variance Estimate	0.00271409		
Standard Deviation	0.05209689		
Akaike's 'A' Information Criterion	-115.72747		
Schwarz's Bayesian Criterion	-114.08988		
RSquare	0.66264604		
RSquare Adj	0.66264604		
MAPE	7.15036444		
MAE	0.0416795		
-2LogLikelihood	-117.72747		

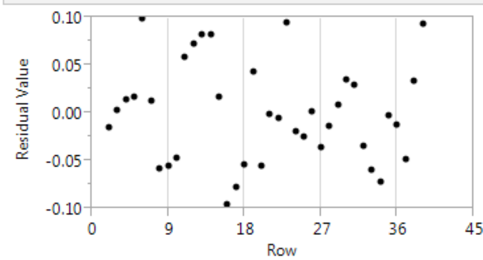
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	0.00603676	0.0083367	0.72	0.4735	0.00603676

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3637	5.4336	0.0198*	1	0.3637
2	-0.0711	5.6472	0.0594	2	-0.2344
3	-0.3412	10.7019	0.0135*	3	-0.2731
4	-0.3106	15.0145	0.0047*	4	-0.1158
5	-0.3037	19.2626	0.0017*	5	-0.2814
6	-0.1432	20.2365	0.0025*	6	-0.1353
7	0.1305	21.0722	0.0037*	7	0.0560
8	0.3449	27.0982	0.0007*	8	0.1109
9	0.1866	28.9235	0.0007*	9	-0.1198
10	-0.0138	28.9339	0.0013*	10	-0.0595
11	-0.1188	29.7291	0.0017*	11	-0.0067
12	-0.0335	29.7945	0.0030*	12	0.1154
13	-0.1325	30.8616	0.0035*	13	-0.1166
14	-0.2314	34.2542	0.0019*	14	-0.2182
15	-0.0293	34.3111	0.0031*	15	0.0742
16	0.2544	38.7813	0.0012*	16	0.1615
17	0.2862	44.7108	0.0003*	17	0.0825
18	0.0795	45.1912	0.0004*	18	-0.0518
19	-0.0385	45.3096	0.0006*	19	0.0089
20	-0.0663	45.6809	0.0009*	20	0.0395
21	-0.2495	51.2466	0.0002*	21	-0.1497
22	-0.2462	57.0032	<.0001*	22	0.0233
23	-0.1356	58.8678	<.0001*	23	-0.1185
24	0.1172	60.3603	<.0001*	24	-0.0903
25	0.1732	63.8675	<.0001*	25	-0.0777

Model: I(1)

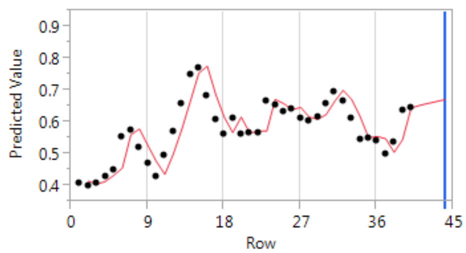
Model Summary

DF	38	Stable	Yes
Sum of Squared Errors	0.10042777	Invertible	Yes
Variance Estimate	0.00264284		
Standard Deviation	0.05140852		
Akaike's 'A' Information Criterion	-119.83604		
Schwarz's Bayesian Criterion	-118.17248		
RSquare	0.6676623		
RSquare Adj	0.6676623		
MAPE	6.97790208		
MAE	0.04067916		
-2LogLikelihood	-121.83604		

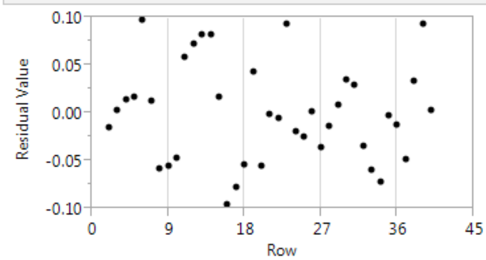
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	0.00610343	0.0081195	0.75	0.4569	0.00610343

Forecast



Residuals



Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3661	5.6387	0.0176*	1	0.3661
2	-0.0702	5.8516	0.0536	2	-0.2358
3	-0.3423	11.0566	0.0114*	3	-0.2742
4	-0.3108	15.4709	0.0038*	4	-0.1132
5	-0.3036	19.8060	0.0014*	5	-0.2813
6	-0.1449	20.8237	0.0020*	6	-0.1365
7	0.1290	21.6556	0.0029*	7	0.0577
8	0.3439	27.7559	0.0005*	8	0.1093
9	0.1873	29.6249	0.0005*	9	-0.1214
10	-0.0129	29.6341	0.0010*	10	-0.0588
11	-0.1186	30.4370	0.0014*	11	-0.0072
12	-0.0337	30.5042	0.0023*	12	0.1136
13	-0.1333	31.5964	0.0028*	13	-0.1195
14	-0.2313	35.0174	0.0015*	14	-0.2167
15	-0.0299	35.0771	0.0024*	15	0.0756
16	0.2538	39.5569	0.0009*	16	0.1597
17	0.2886	45.6097	0.0002*	17	0.0829
18	0.0794	46.0896	0.0003*	18	-0.0549
19	-0.0385	46.2080	0.0005*	19	0.0116
20	-0.0678	46.5944	0.0007*	20	0.0378
21	-0.2484	52.0760	0.0002*	21	-0.1498
22	-0.2475	57.8381	<.0001*	22	0.0213
23	-0.1376	59.7315	<.0001*	23	-0.1189
24	0.1147	61.1339	<.0001*	24	-0.0926
25	0.1735	64.5714	<.0001*	25	-0.0771

Model: I(1)

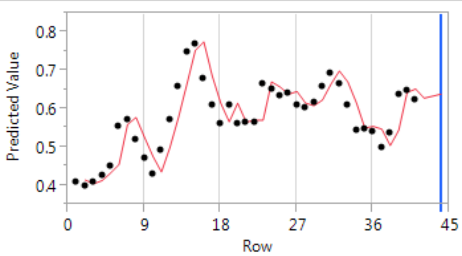
Model Summary

DF	39	Stable	Yes
Sum of Squared Errors	0.101302	Invertible	Yes
Variance Estimate	0.00259749		
Standard Deviation	0.05096555		
Akaike's 'A' Information Criterion	-123.62606		
Schwarz's Bayesian Criterion	-121.93718		
RSquare	0.66670894		
RSquare Adj	0.66670894		
MAPE	6.91420307		
MAE	0.04037335		
-2LogLikelihood	-125.62606		

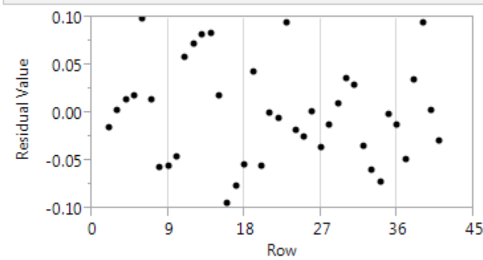
Parameter Estimates

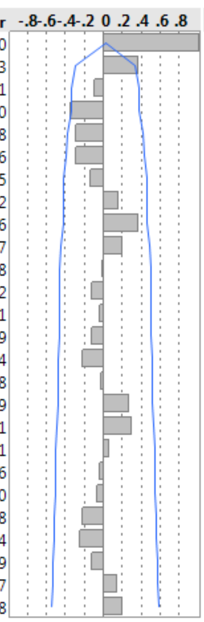
Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	0.00535482	0.0079505	0.67	0.5046	0.00535482

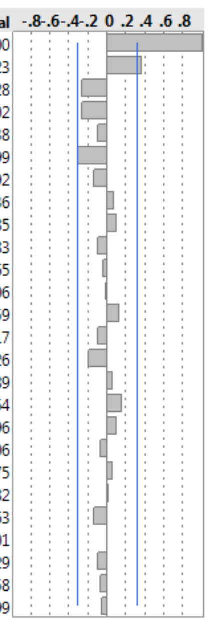
Forecast



Residuals







Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3623	5.6533	0.0174*	1	0.3623
2	-0.0971	6.0698	0.0481*	2	-0.2628
3	-0.3500	11.6330	0.0088*	3	-0.2602
4	-0.2948	15.6874	0.0035*	4	-0.1038
5	-0.2986	19.9679	0.0013*	5	-0.3099
6	-0.1445	20.9990	0.0018*	6	-0.1392
7	0.1482	22.1179	0.0024*	7	0.0736
8	0.3586	28.8675	0.0003*	8	0.0985
9	0.1967	30.9651	0.0003*	9	-0.0983
10	-0.0208	30.9893	0.0006*	10	-0.0465
11	-0.1282	31.9418	0.0008*	11	-0.0106
12	-0.0371	32.0244	0.0014*	12	0.1259
13	-0.1299	33.0750	0.0017*	13	-0.1017
14	-0.2204	36.2131	0.0010*	14	-0.1926
15	-0.0308	36.2770	0.0016*	15	0.0589
16	0.2589	40.9684	0.0006*	16	0.1554
17	0.2921	47.2005	0.0001*	17	0.0996
18	0.0511	47.4002	0.0002*	18	-0.0706
19	-0.0366	47.5074	0.0003*	19	0.0575
20	-0.0670	47.8850	0.0004*	20	0.0182
21	-0.2298	52.5532	0.0002*	21	-0.1363
22	-0.2584	58.7859	<.0001*	22	-0.0001
23	-0.1209	60.2295	<.0001*	23	-0.0929
24	0.1367	62.1917	<.0001*	24	-0.0758
25	0.2008	66.7094	<.0001*	25	-0.0499

Model: I(1)

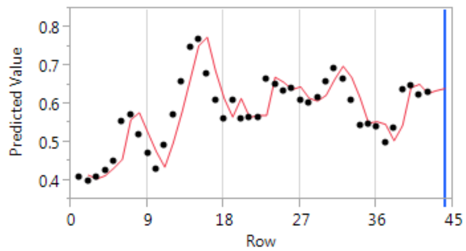
Model Summary

DF	40	Stable	Yes
Sum of Squared Errors	0.10130636	Invertible	Yes
Variance Estimate	0.00253266		
Standard Deviation	0.05032553		
Akaike's 'A' Information Criterion	-127.77734		
Schwarz's Bayesian Criterion	-126.06377		
RSquare	0.66923119		
RSquare Adj	0.66923119		
MAPE	6.75417411		
MAE	0.0394415		
-2LogLikelihood	-129.77734		

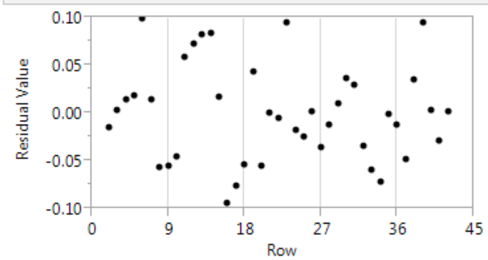
Parameter Estimates

Term	Lag	Estimate	Std Error	t Ratio	Prob>|t|	Constant Estimate
Intercept	0	0.00540643	0.0077630	0.70	0.4902	0.00540643

Forecast



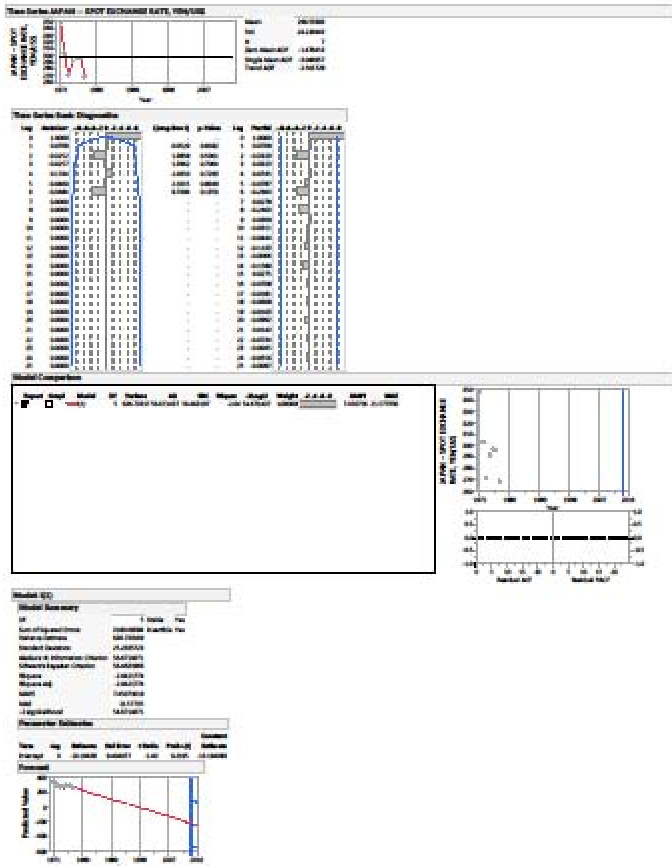
Residuals

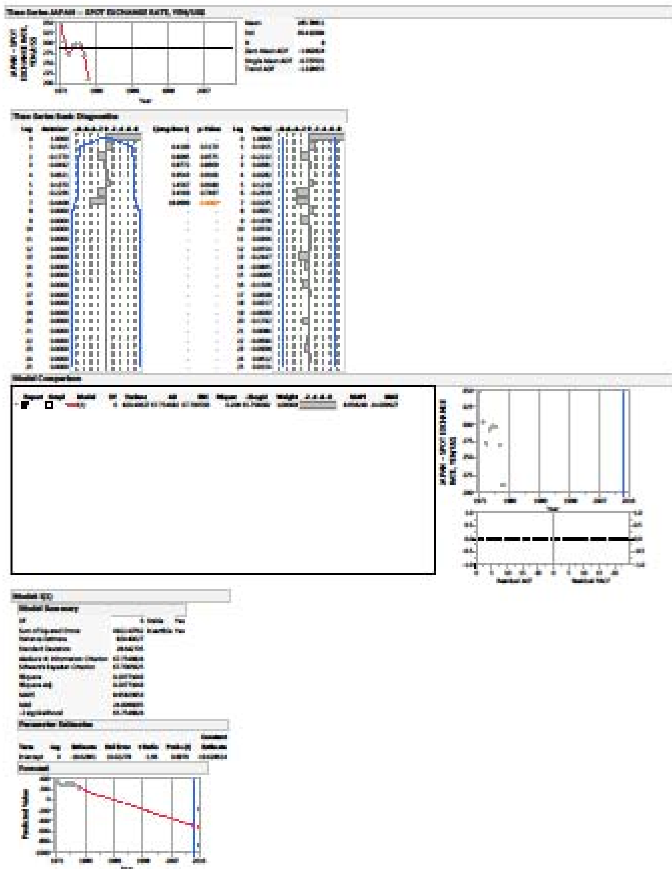


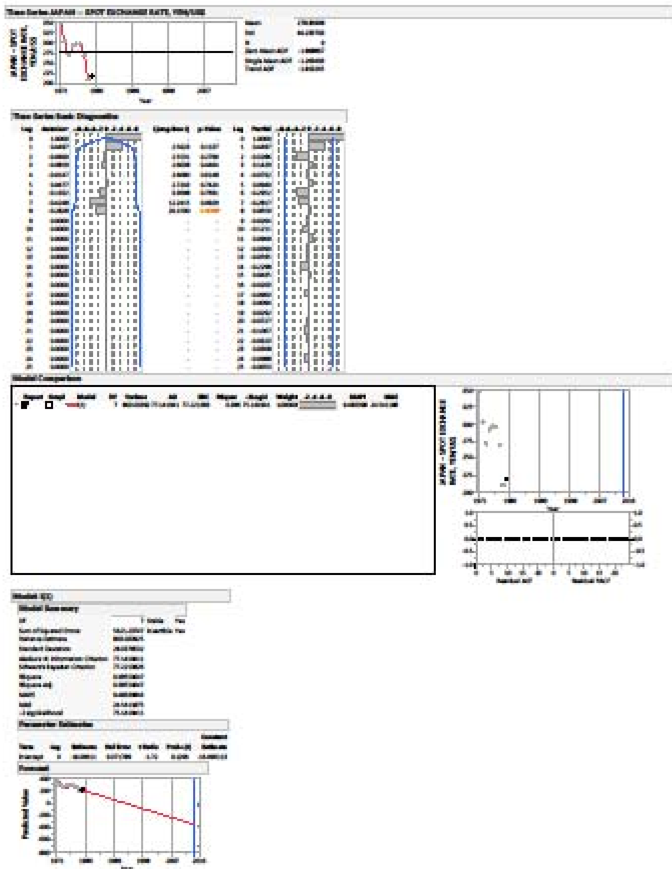
Lag	AutoCorr	Ljung-Box Q	p-Value	Lag	Partial
0	1.0000	.	.	0	1.0000
1	0.3616	5.7641	0.0164*	1	0.3616
2	-0.0970	6.1895	0.0453*	2	-0.2621
3	-0.3481	11.8103	0.0081*	3	-0.2582
4	-0.2940	15.9282	0.0031*	4	-0.1049
5	-0.2995	20.3214	0.0011*	5	-0.3102
6	-0.1446	21.3747	0.0016*	6	-0.1373
7	0.1483	22.5146	0.0021*	7	0.0732
8	0.3571	29.3265	0.0003*	8	0.0972
9	0.1955	31.4314	0.0002*	9	-0.0973
10	-0.0215	31.4578	0.0005*	10	-0.0485
11	-0.1276	32.4148	0.0007*	11	-0.0117
12	-0.0363	32.4950	0.0012*	12	0.1262
13	-0.1296	33.5530	0.0014*	13	-0.1022
14	-0.2205	36.7280	0.0008*	14	-0.1937
15	-0.0315	36.7954	0.0014*	15	0.0562
16	0.2589	41.5229	0.0005*	16	0.1566
17	0.2916	47.7670	<.0001*	17	0.1005
18	0.0507	47.9644	0.0002*	18	-0.0720
19	-0.0347	48.0608	0.0003*	19	0.0577
20	-0.0671	48.4393	0.0004*	20	0.0154
21	-0.2298	53.0930	0.0001*	21	-0.1333
22	-0.2595	59.3421	<.0001*	22	-0.0014
23	-0.1199	60.7511	<.0001*	23	-0.0922
24	0.1356	62.6577	<.0001*	24	-0.0773
25	0.1992	67.0307	<.0001*	25	-0.0504

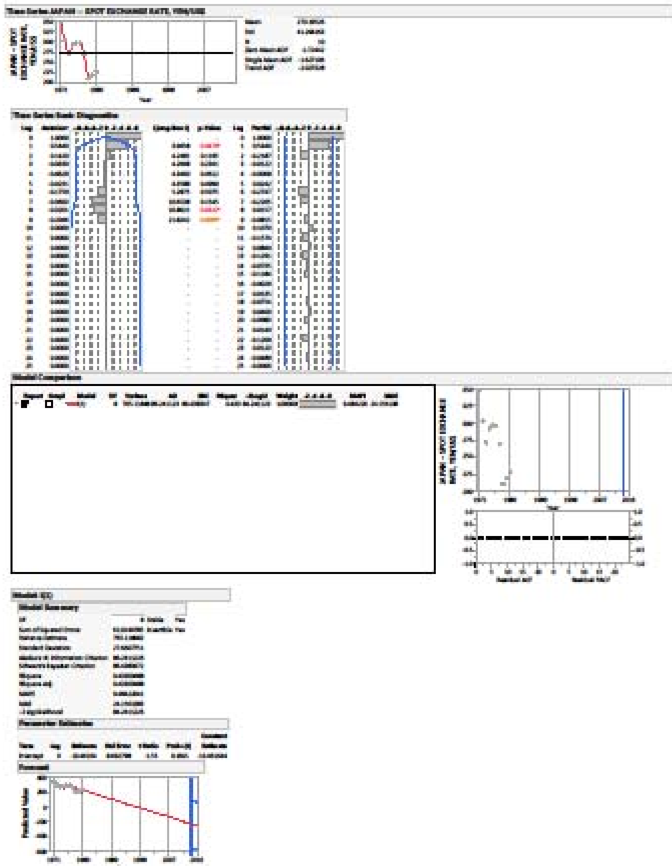
FY79-FY12

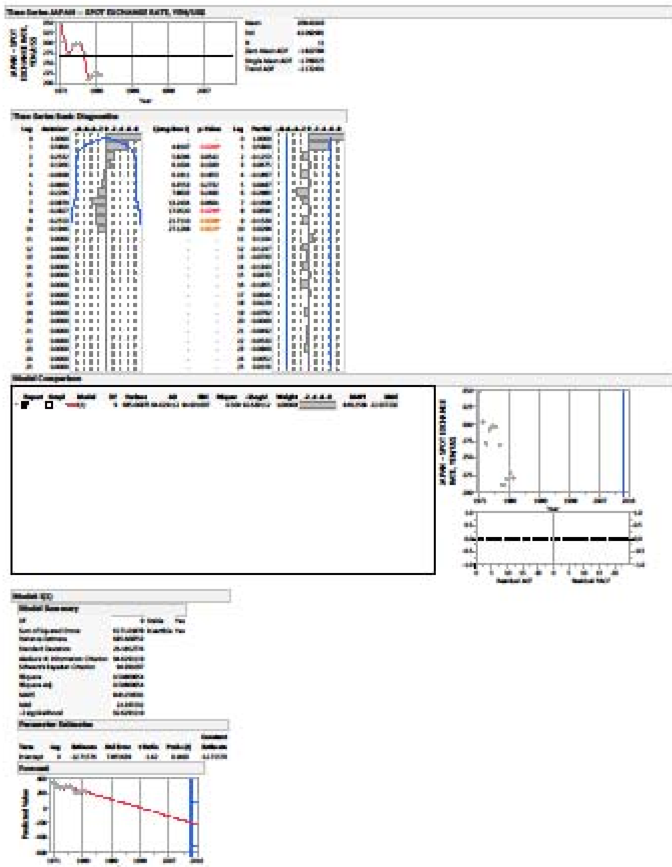
Japan

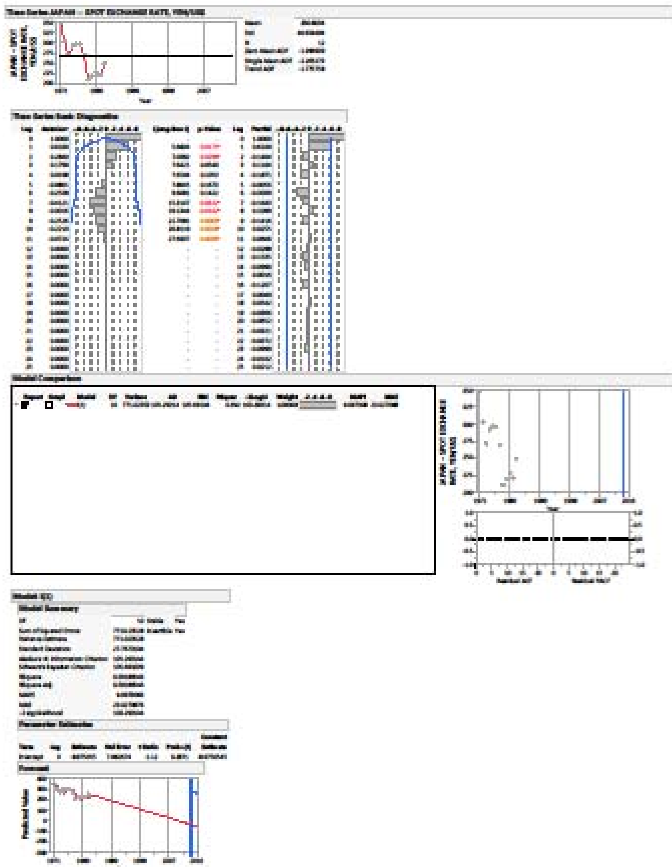


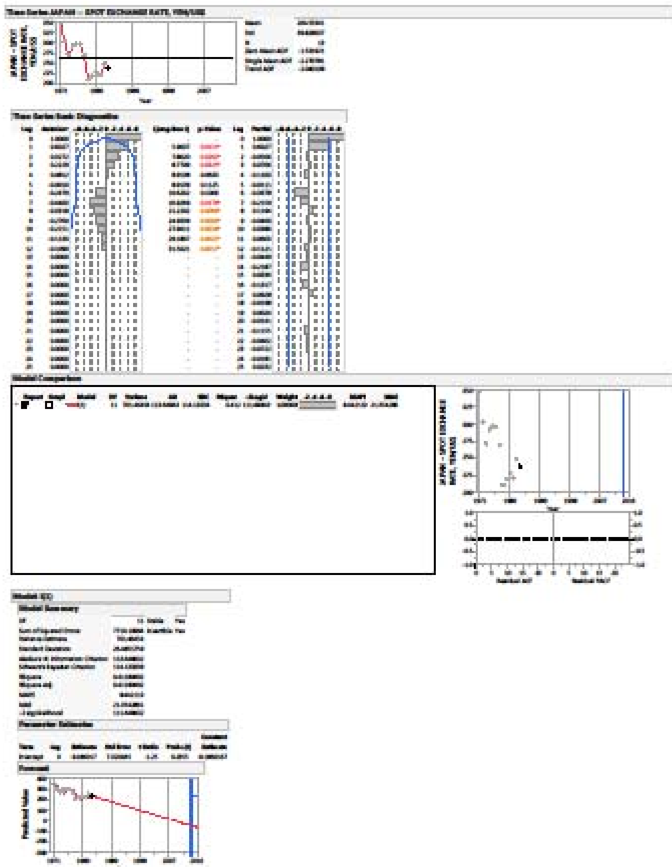


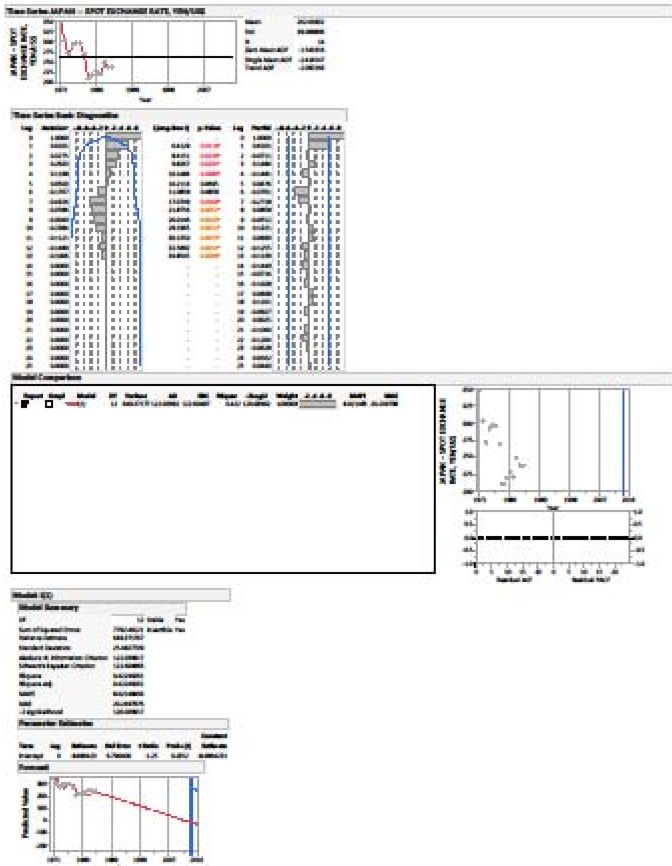


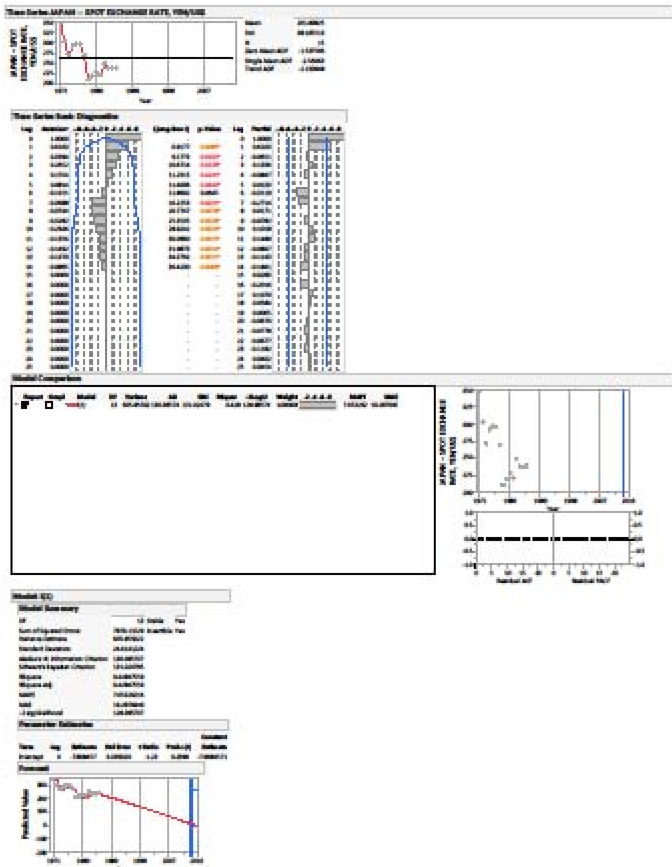


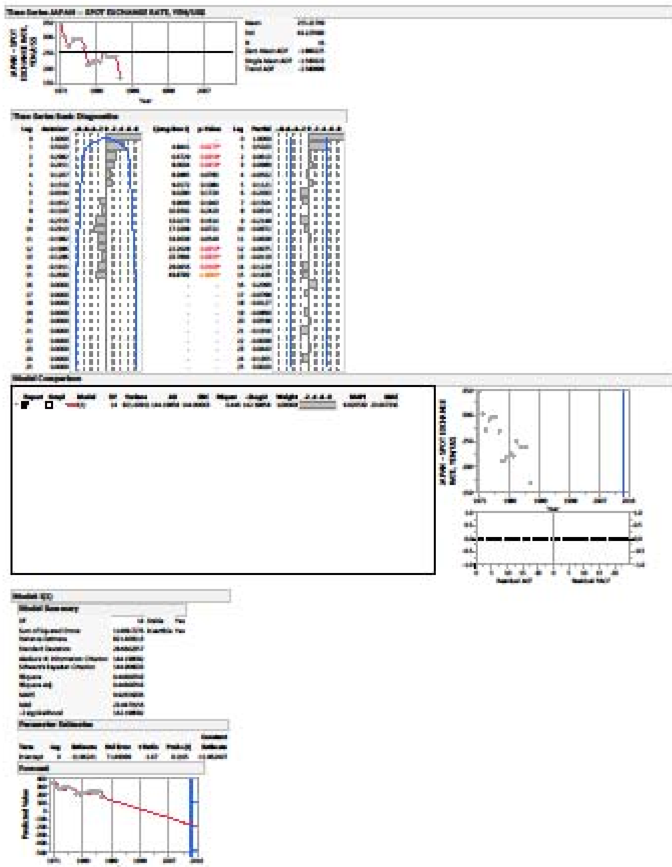


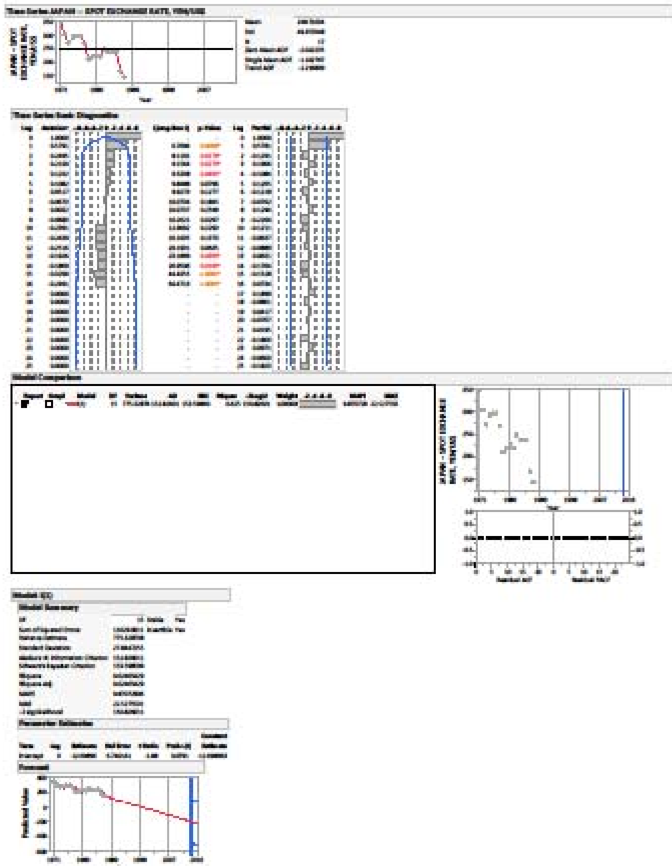


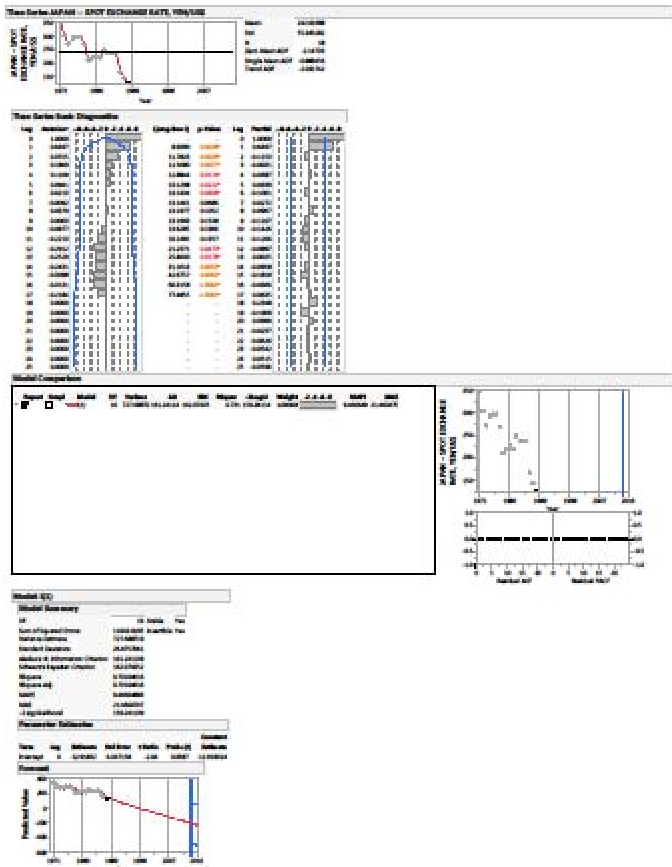


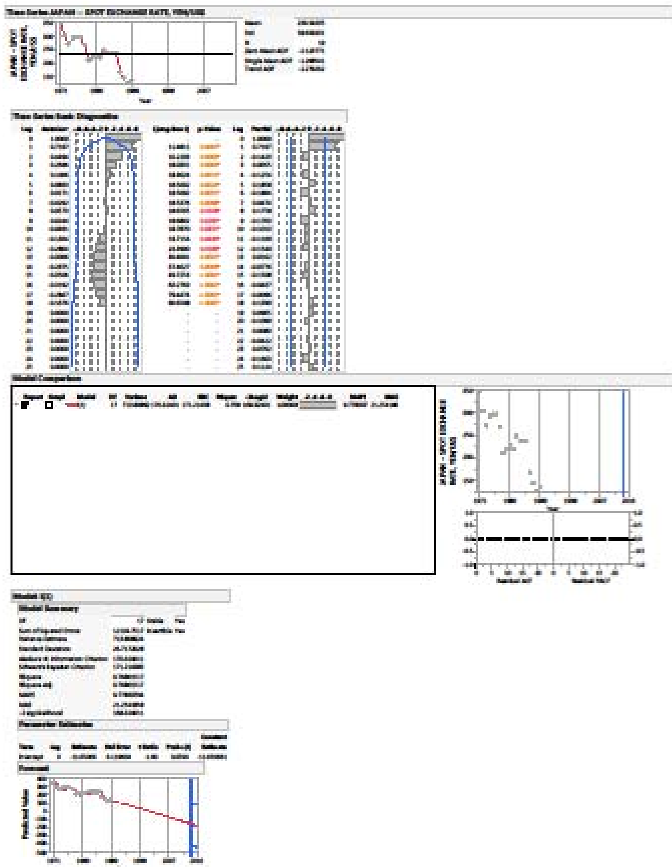


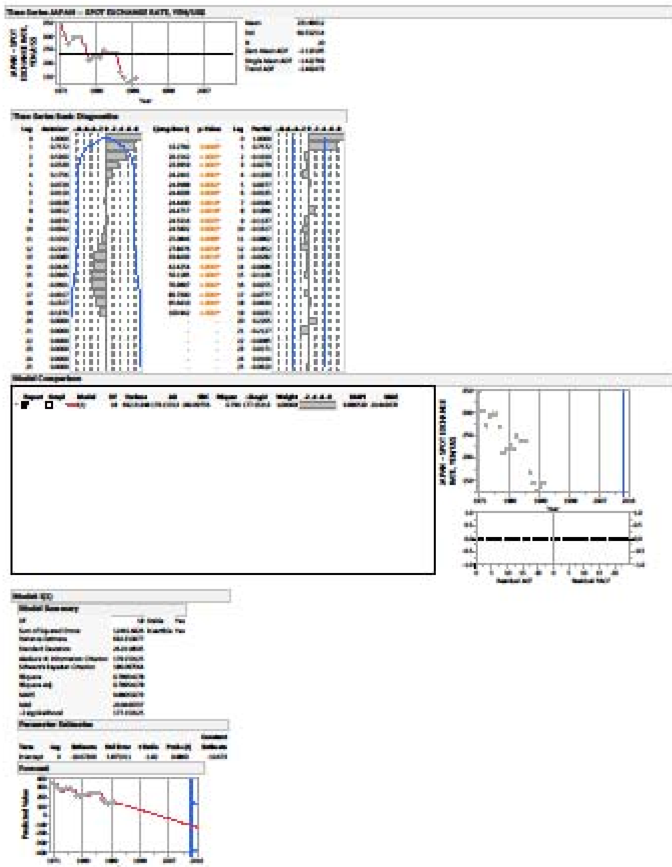


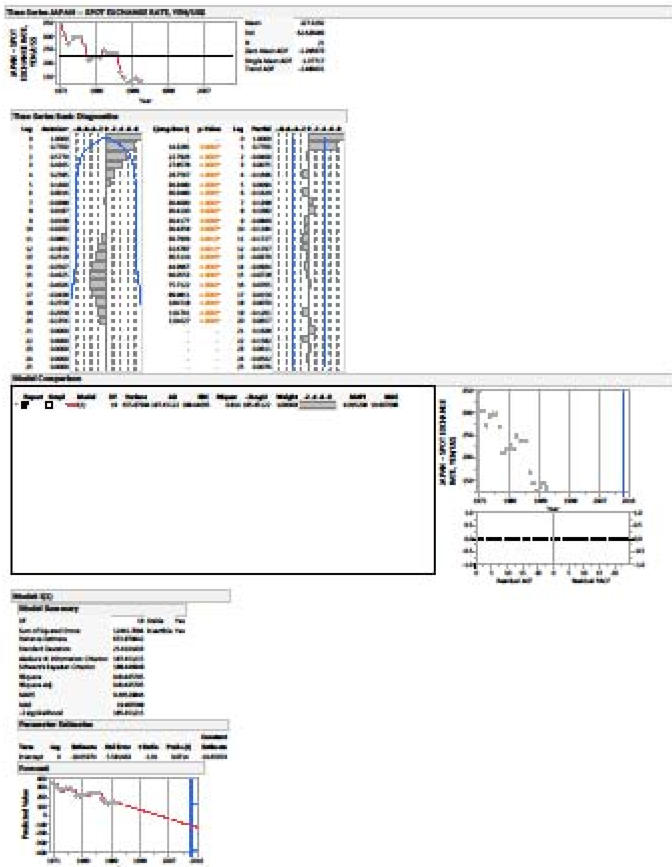


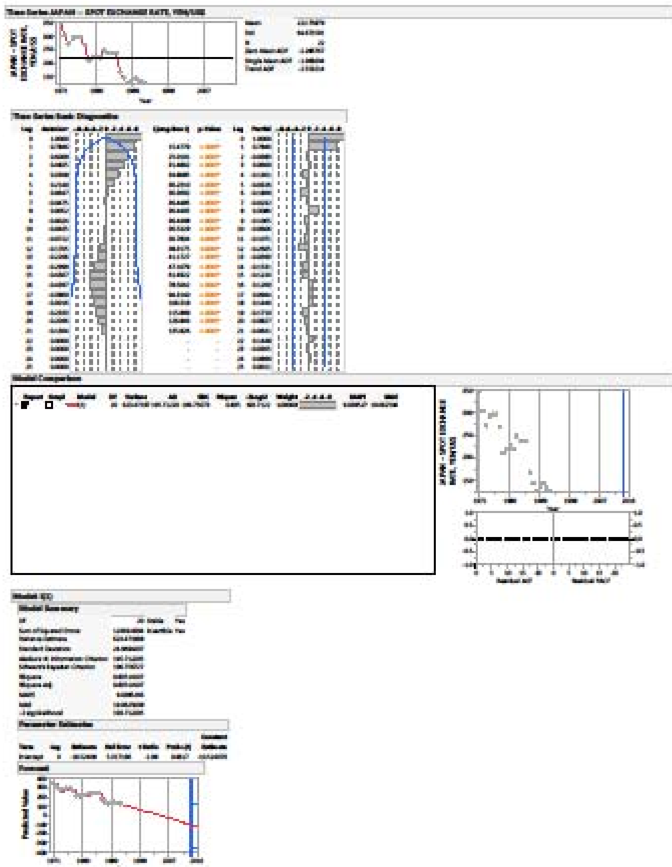












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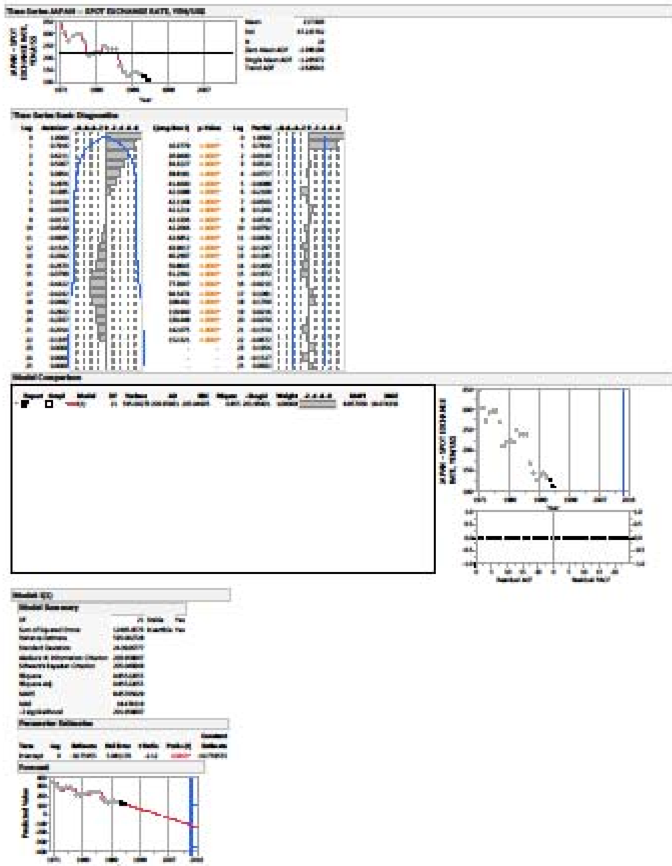
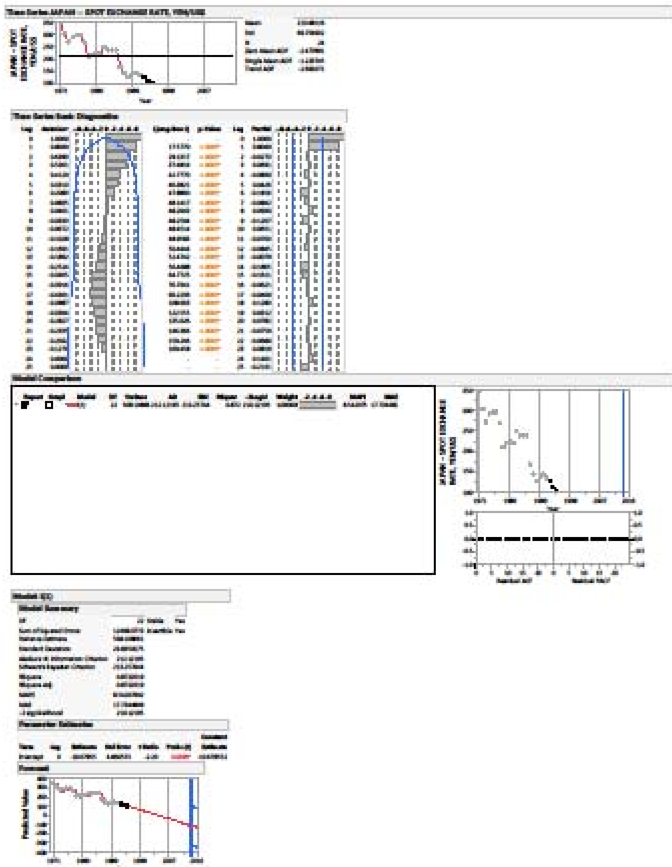
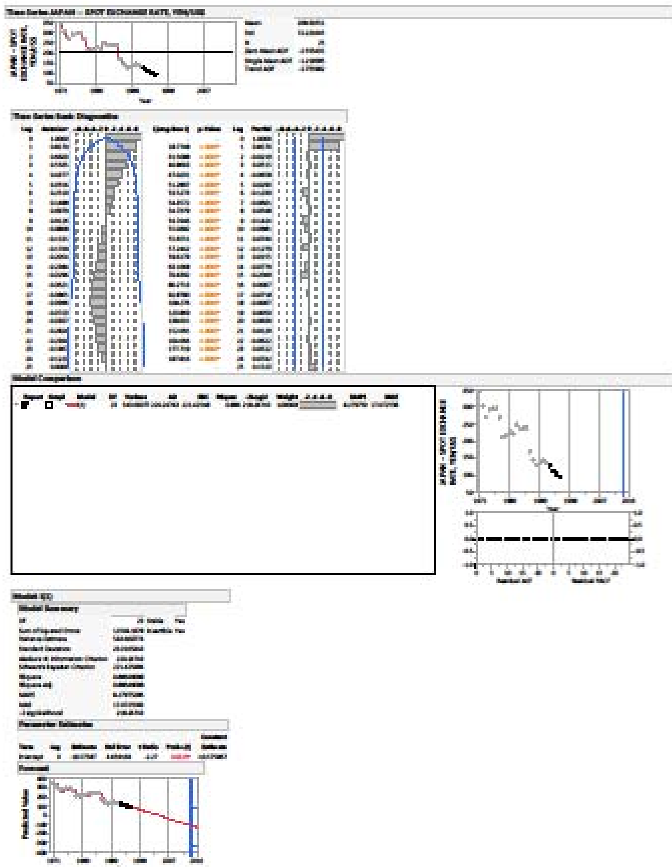
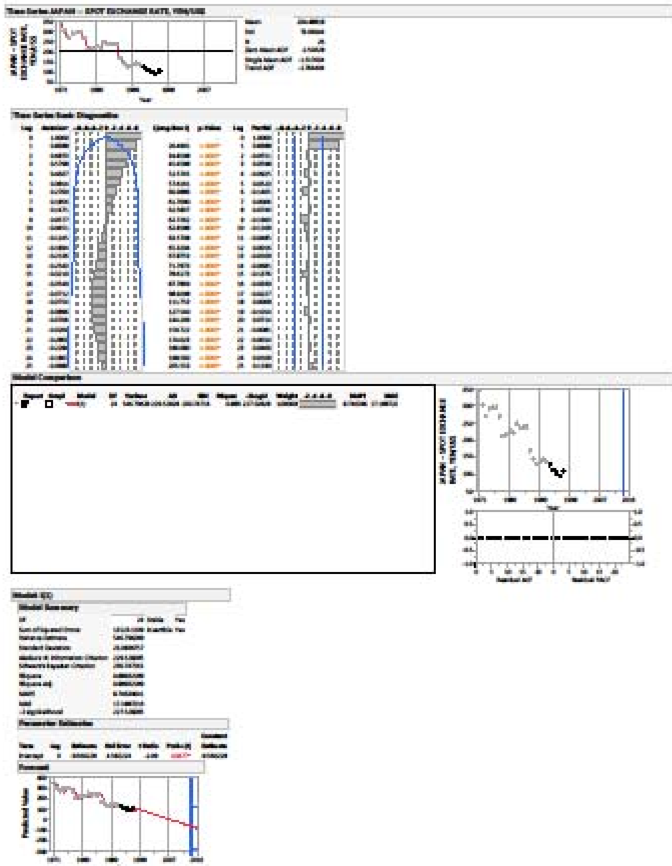
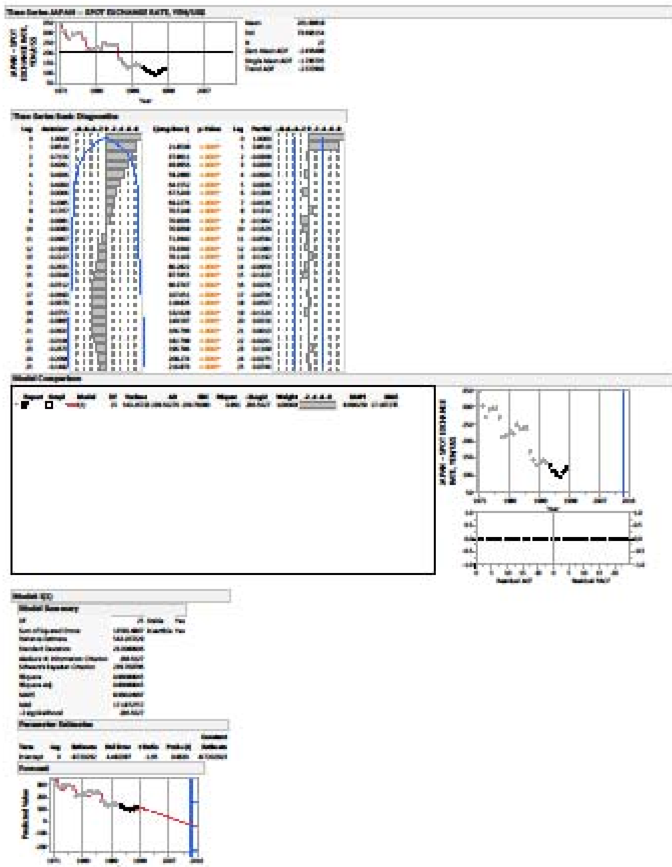
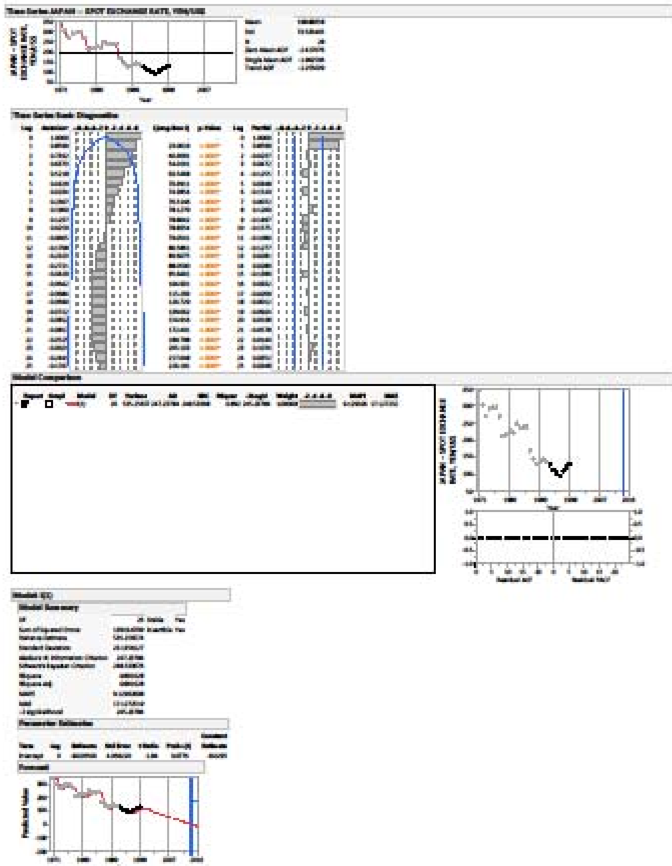


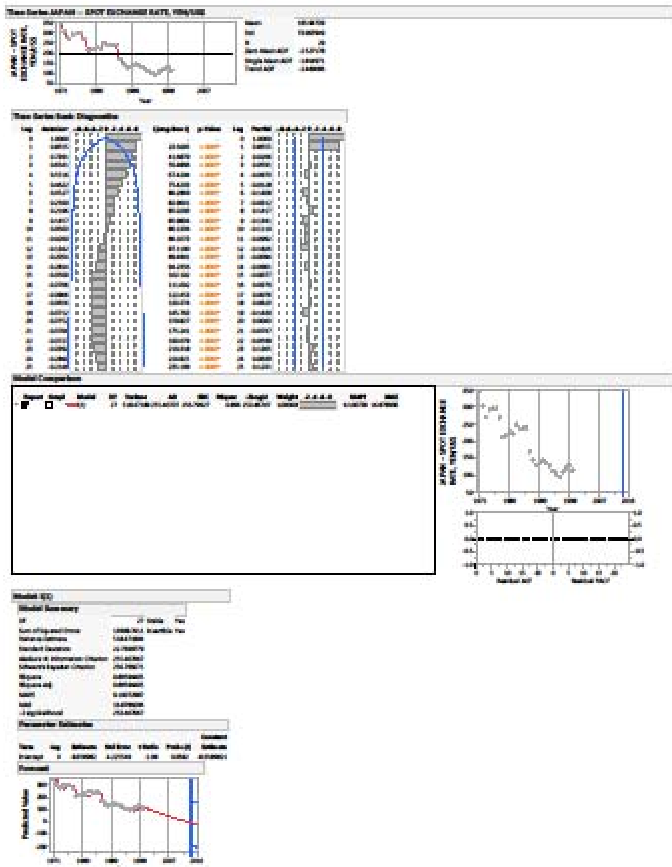


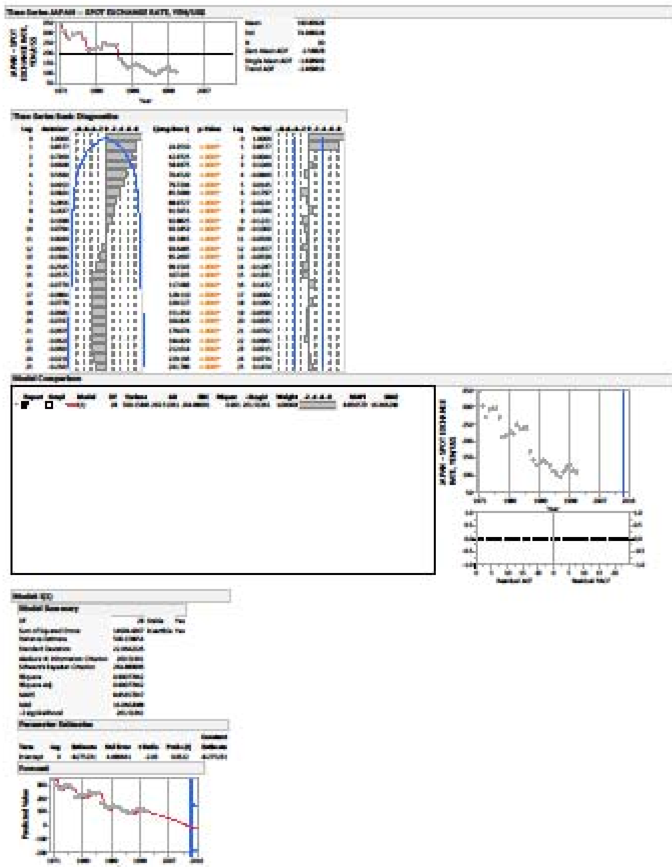


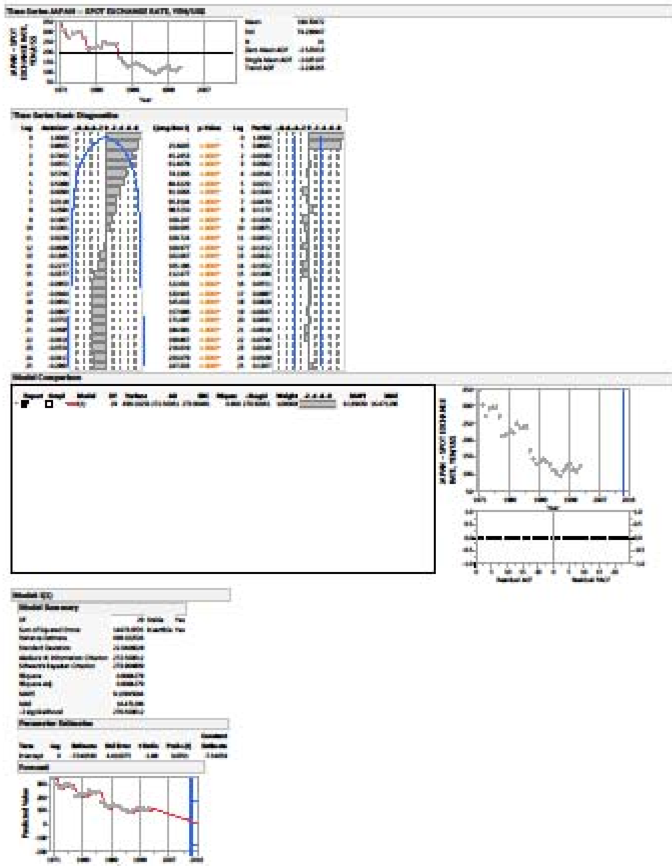


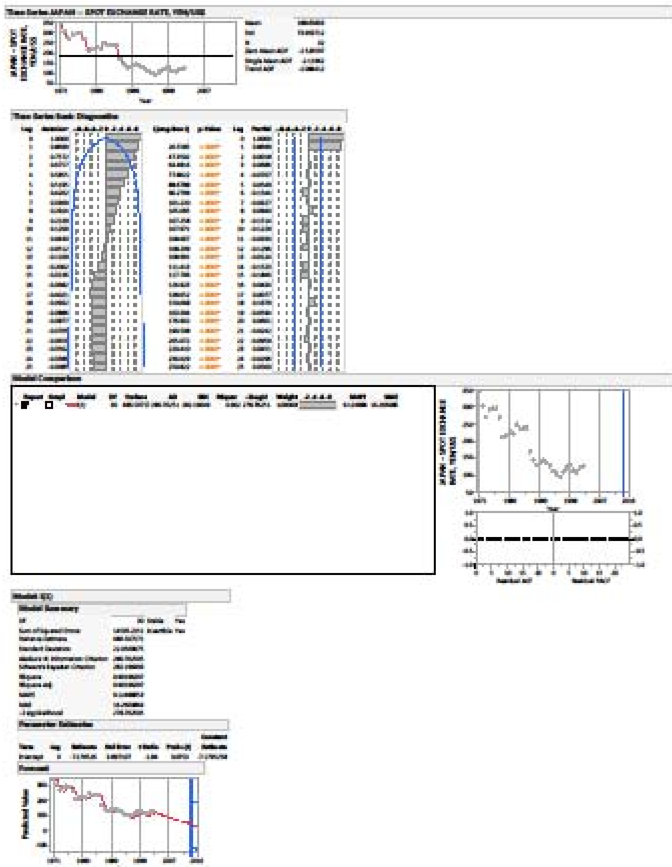


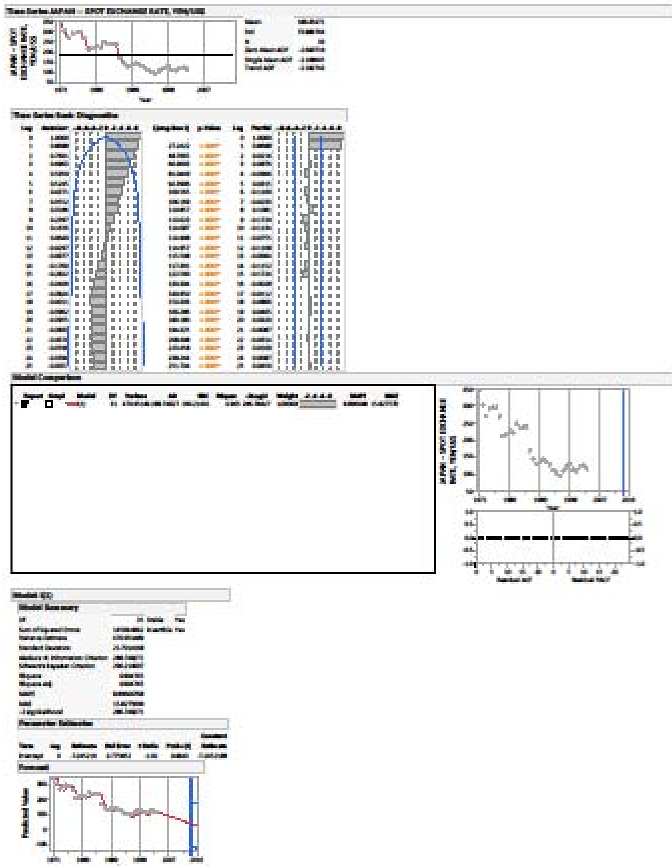


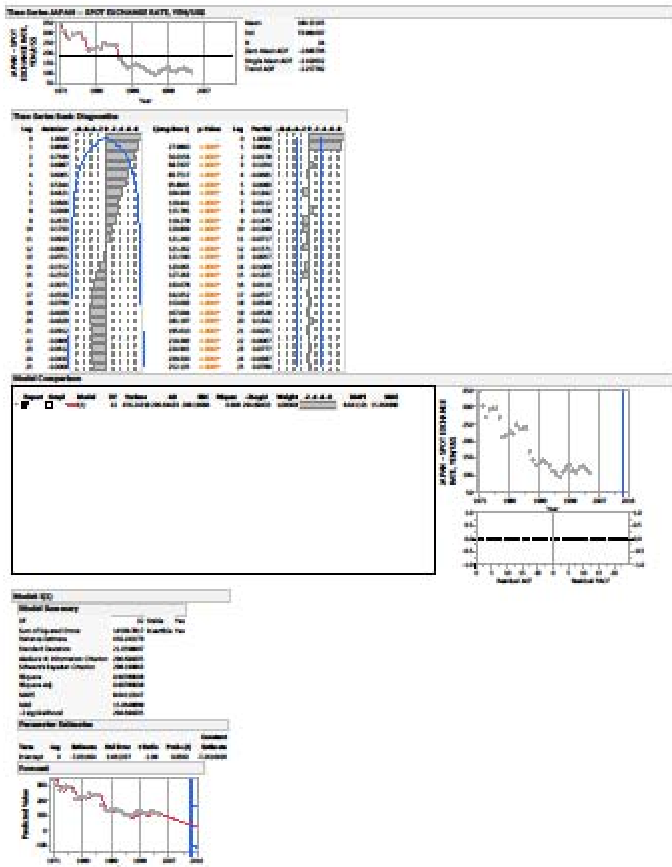


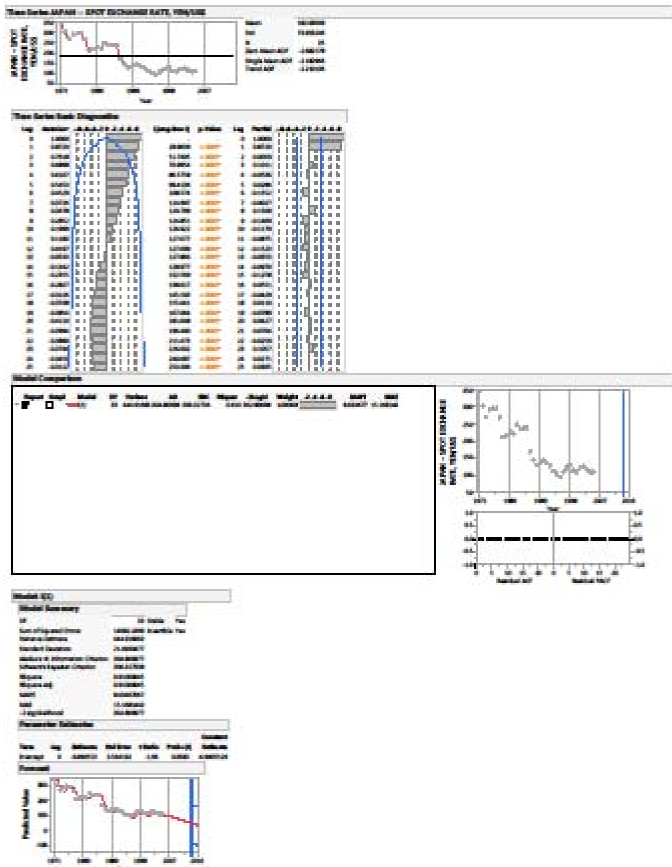


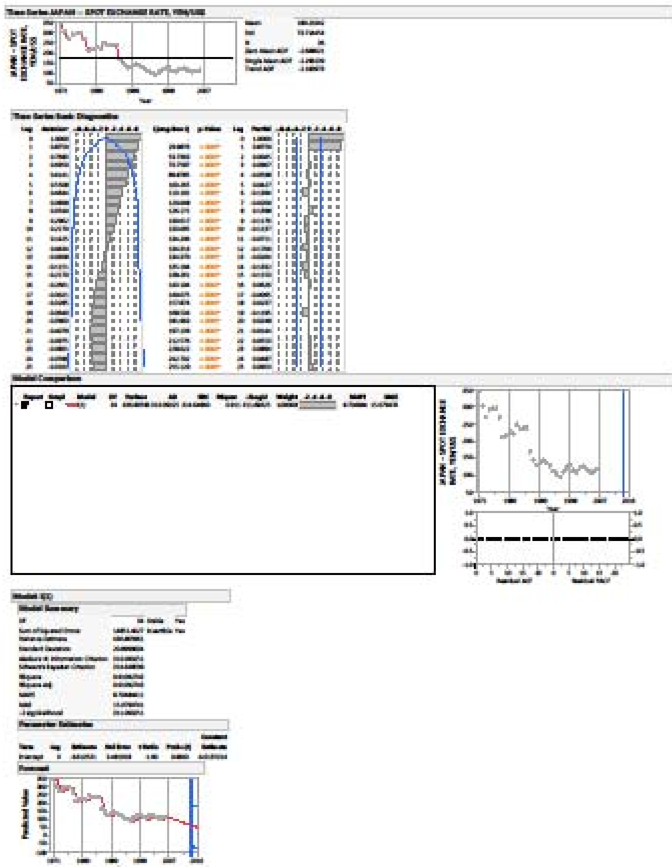


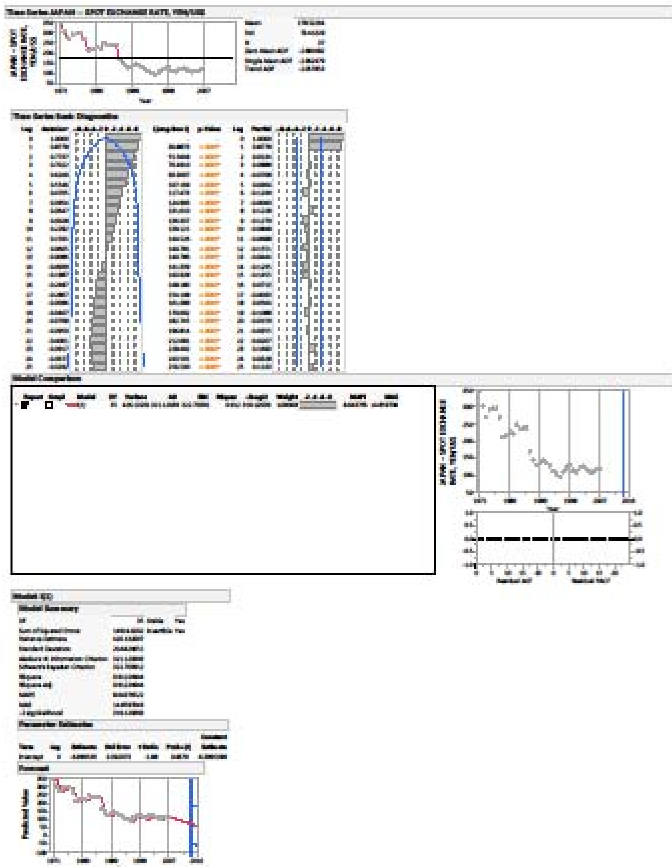


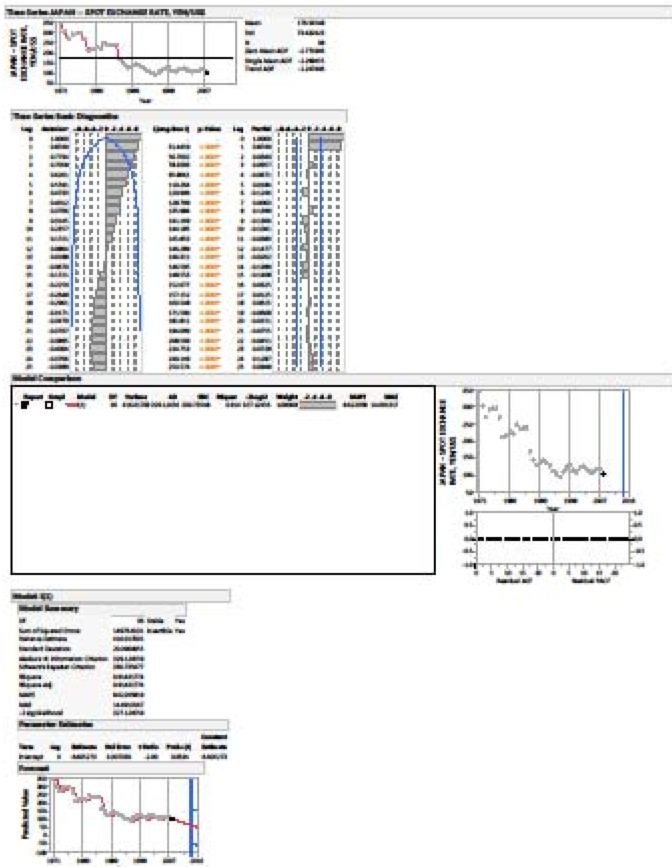


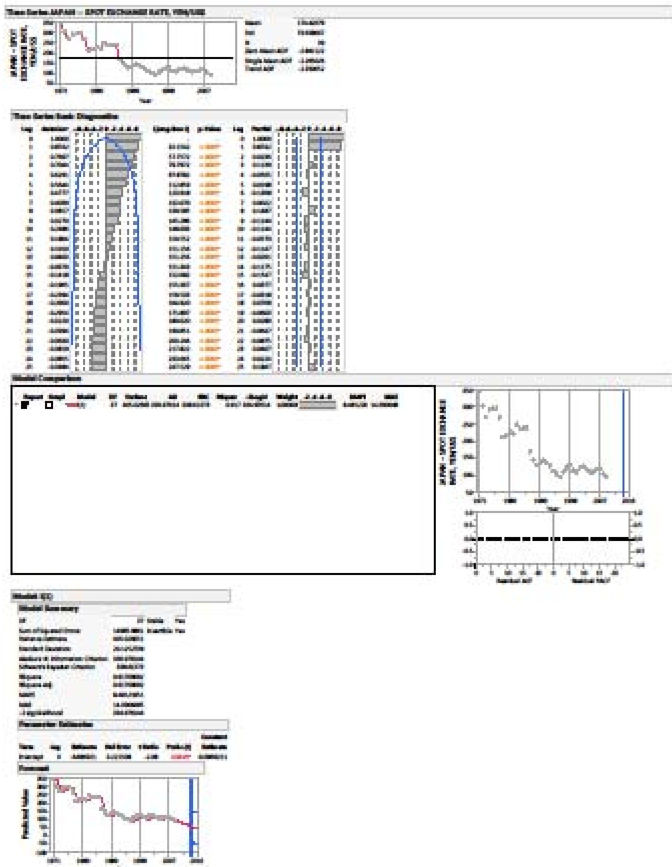


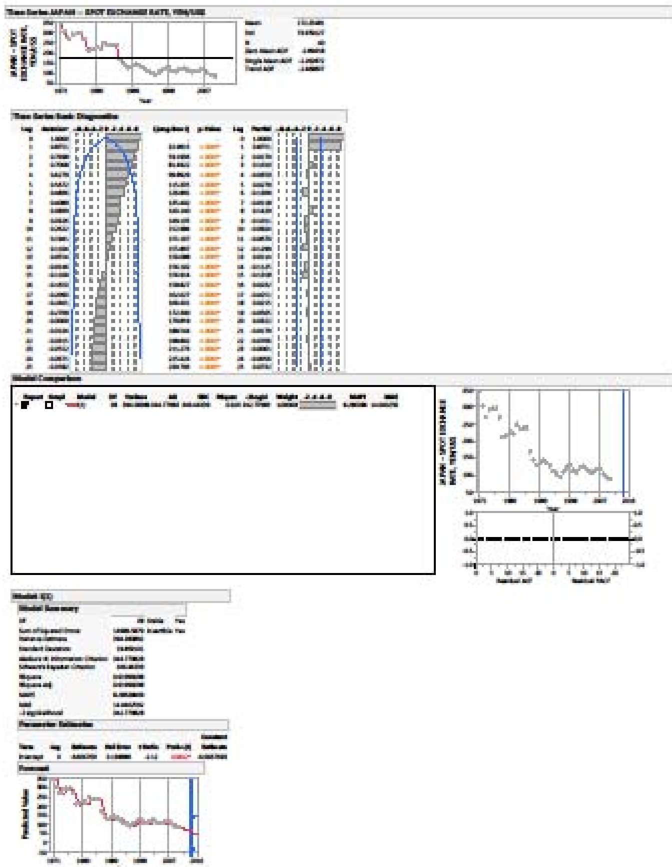




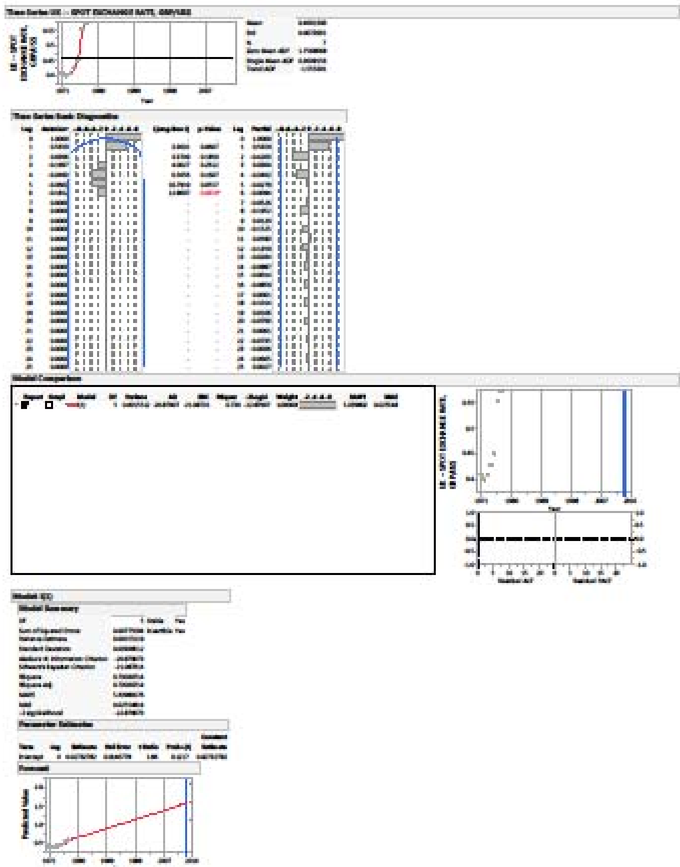


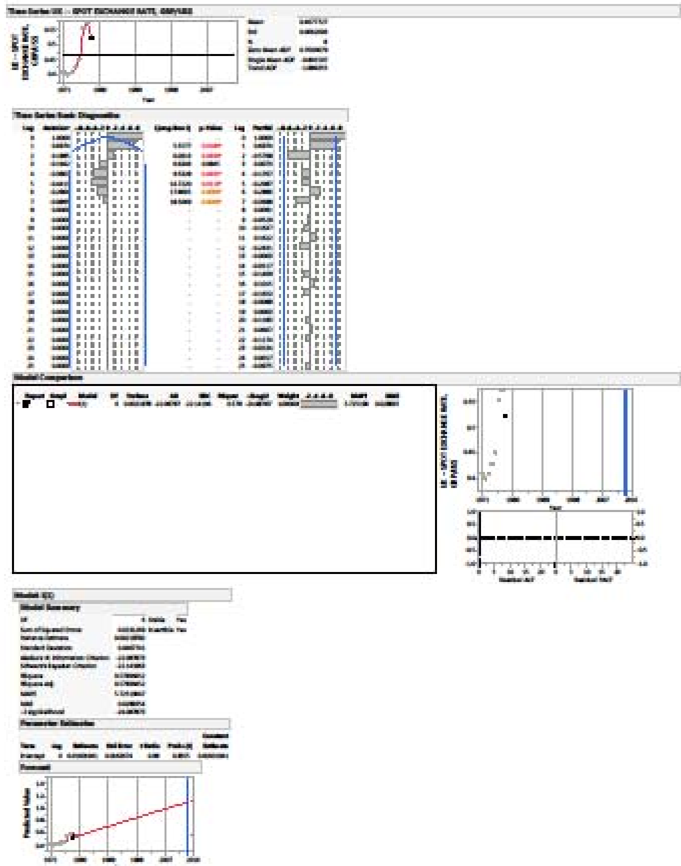


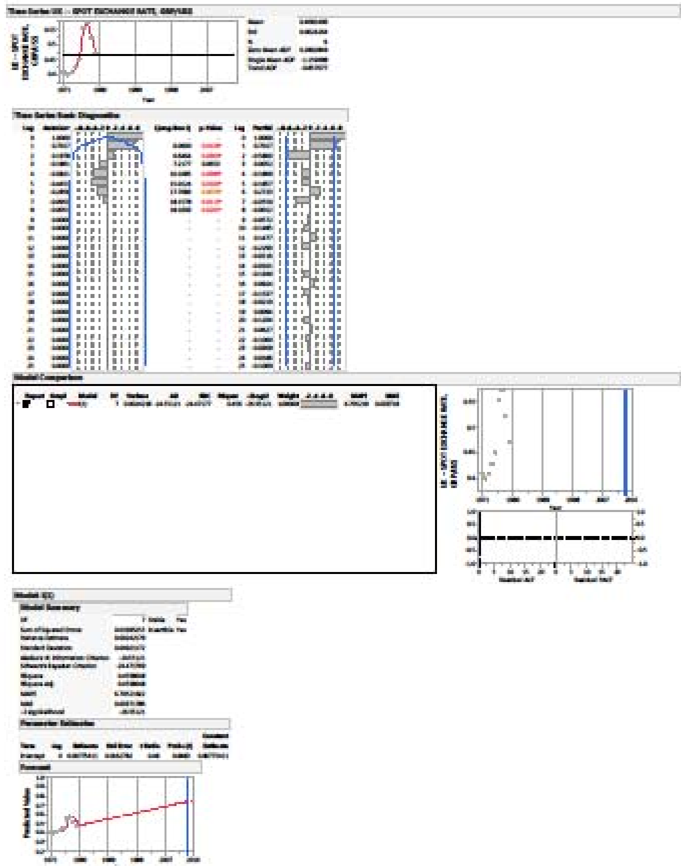


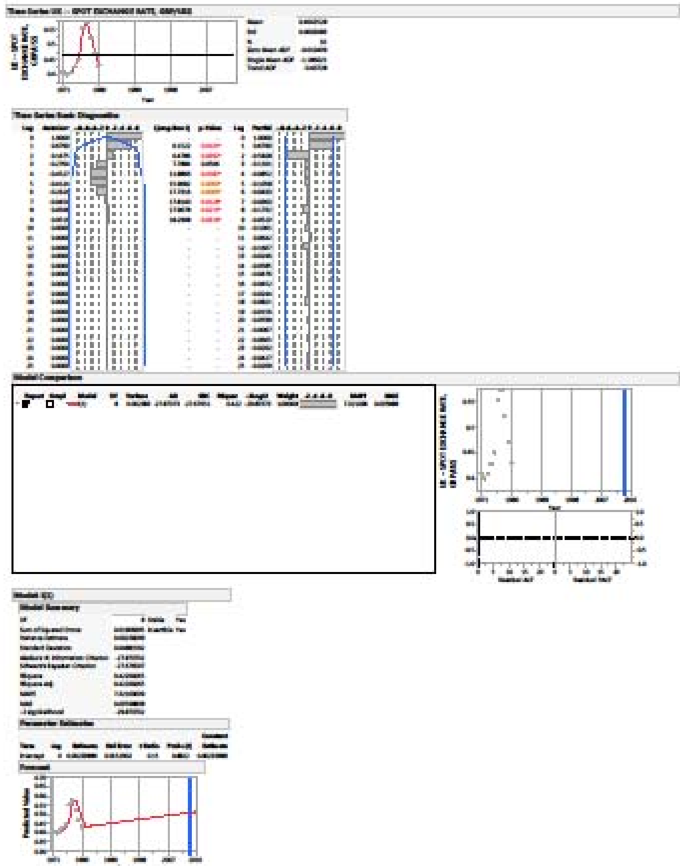


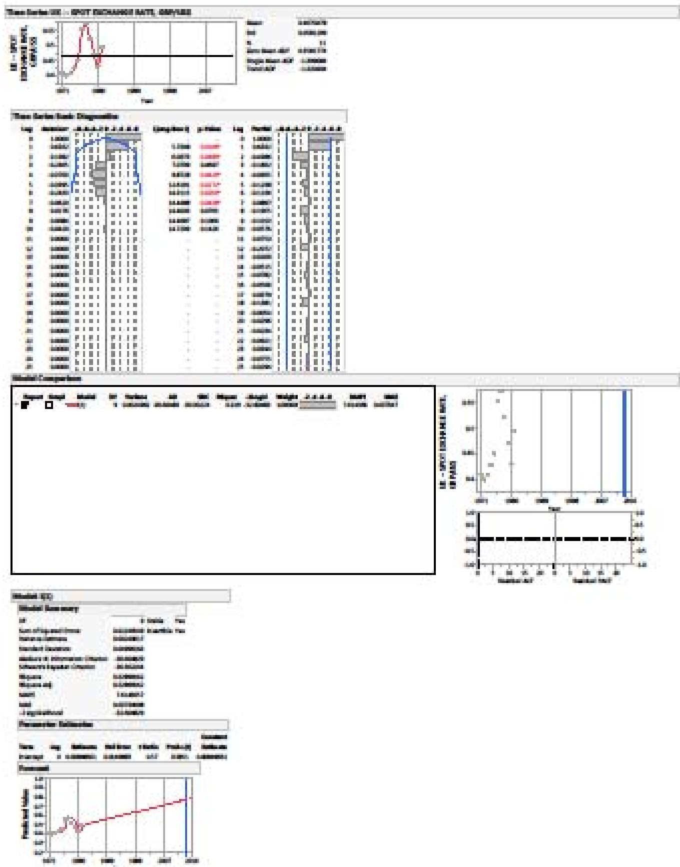
United Kingdom

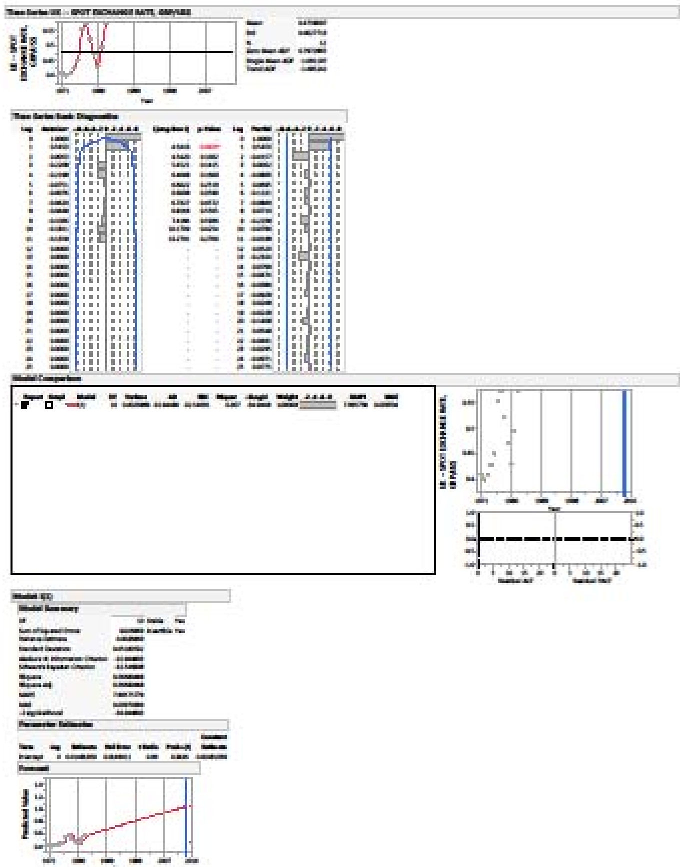


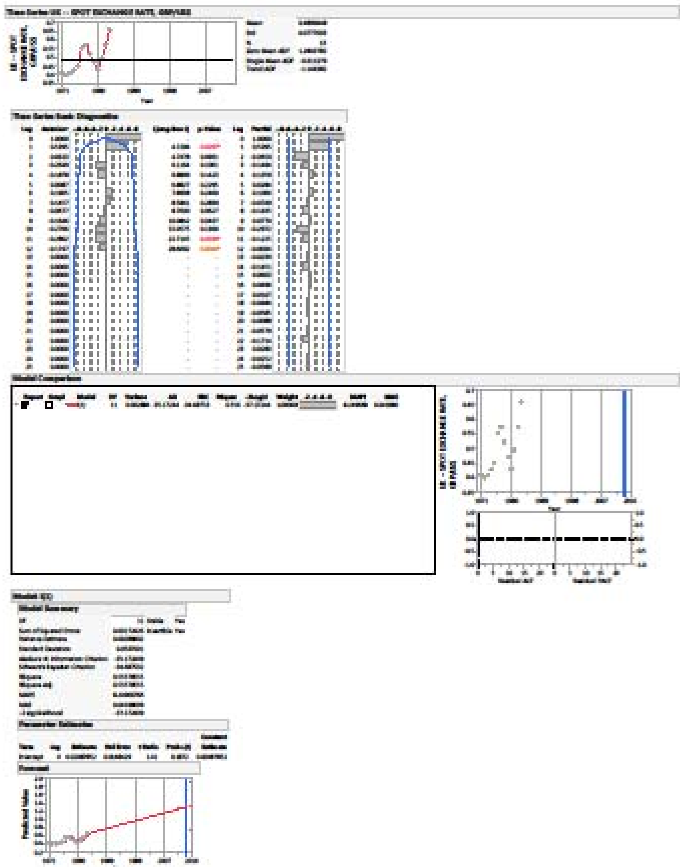


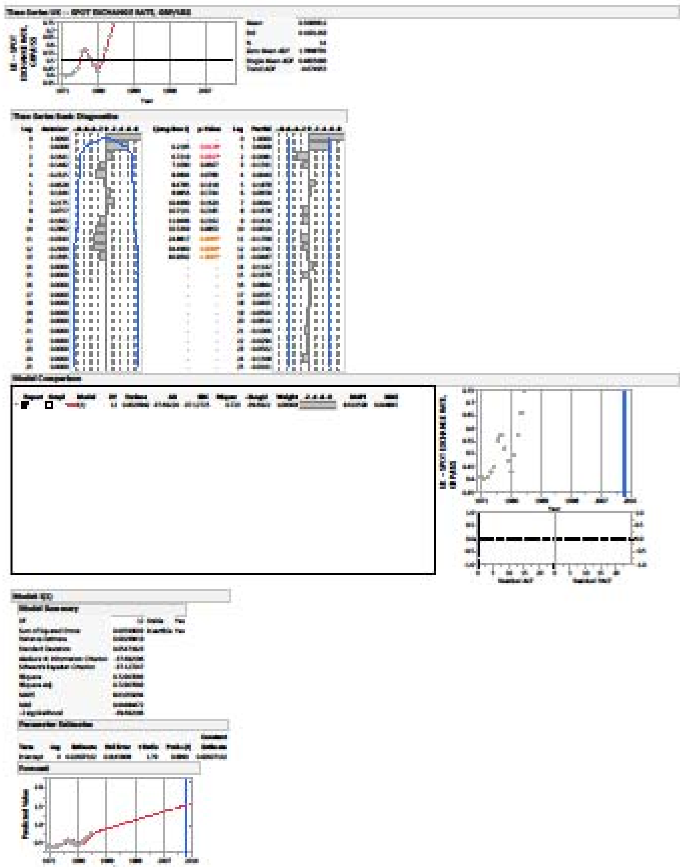


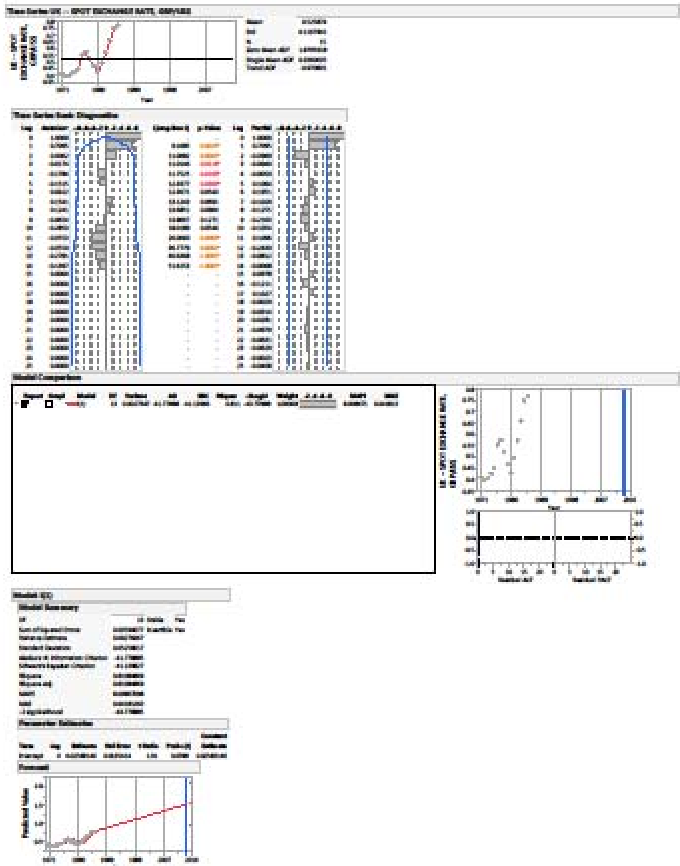


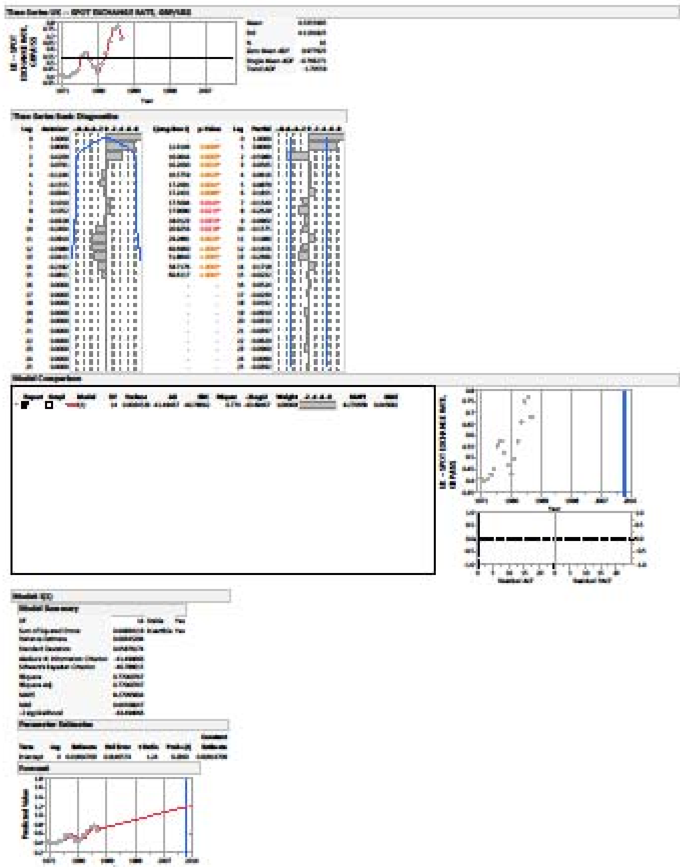


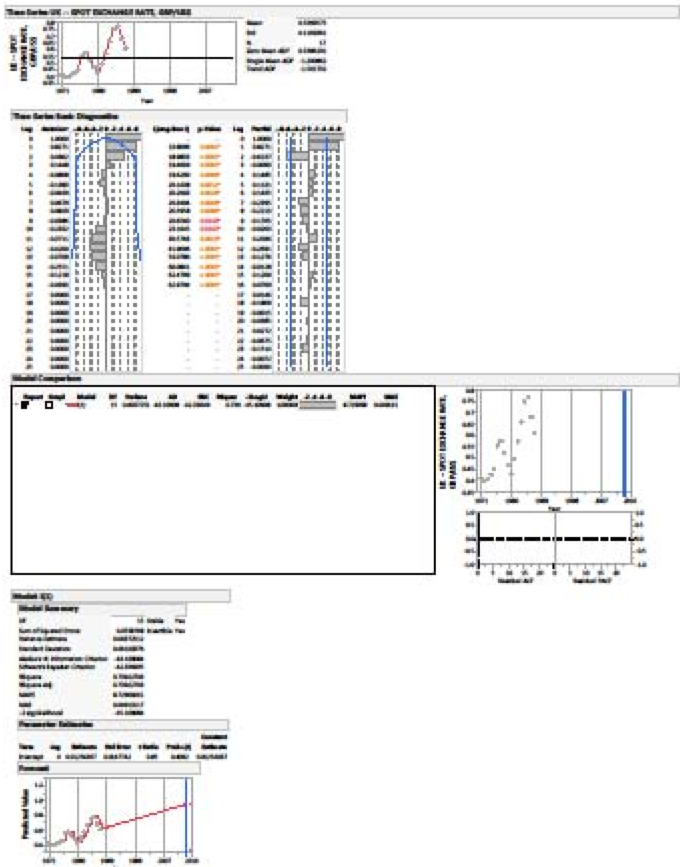


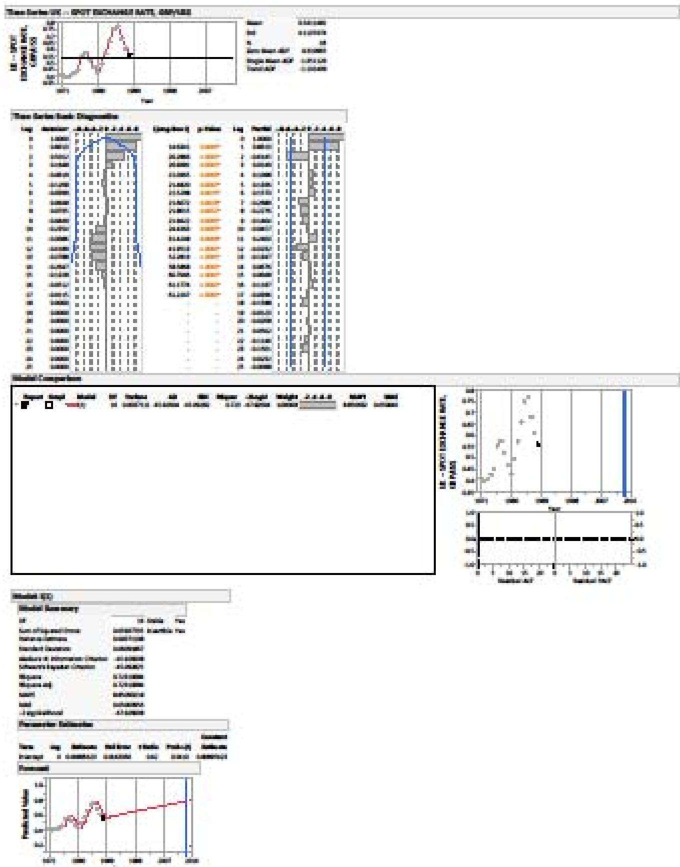


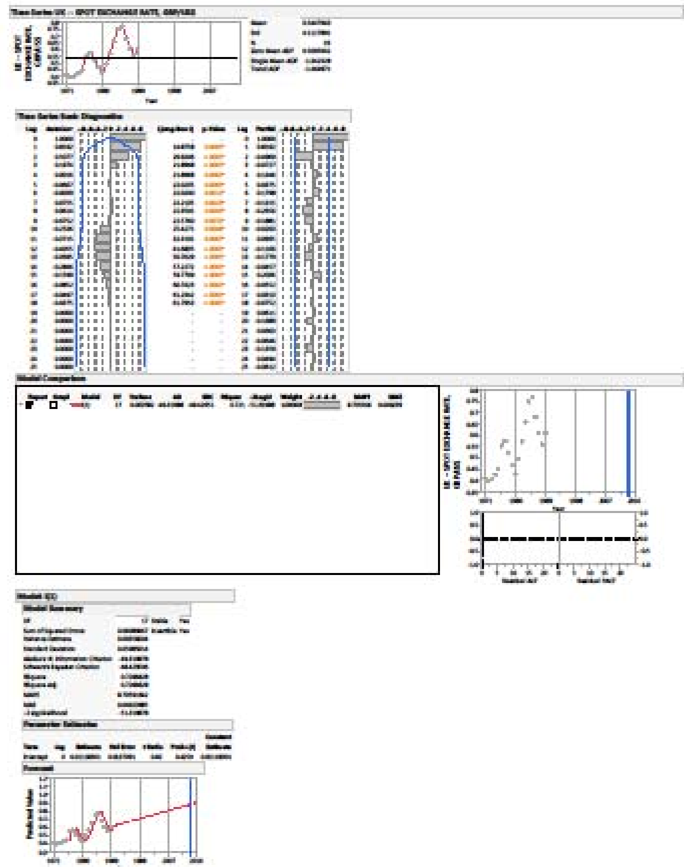


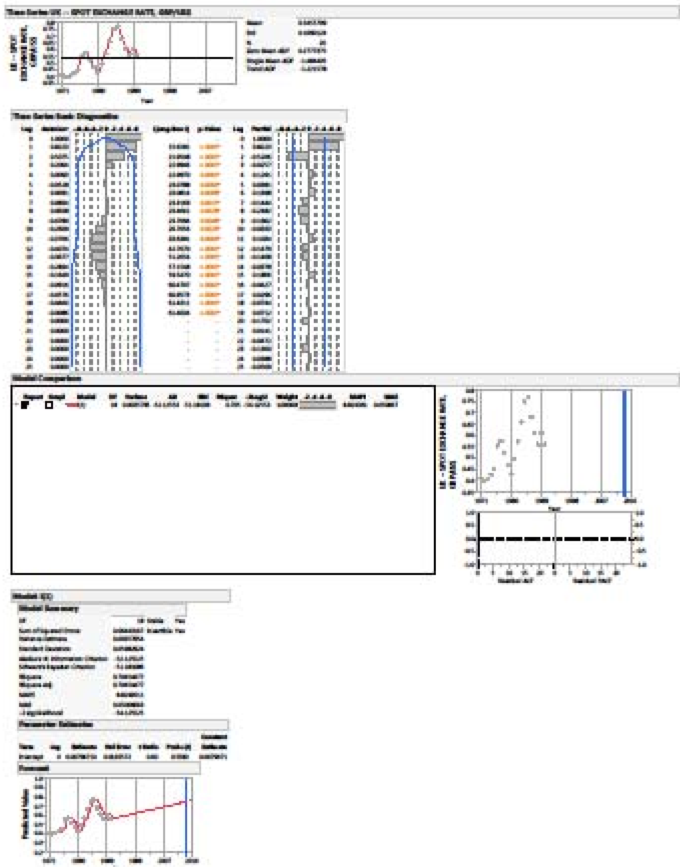


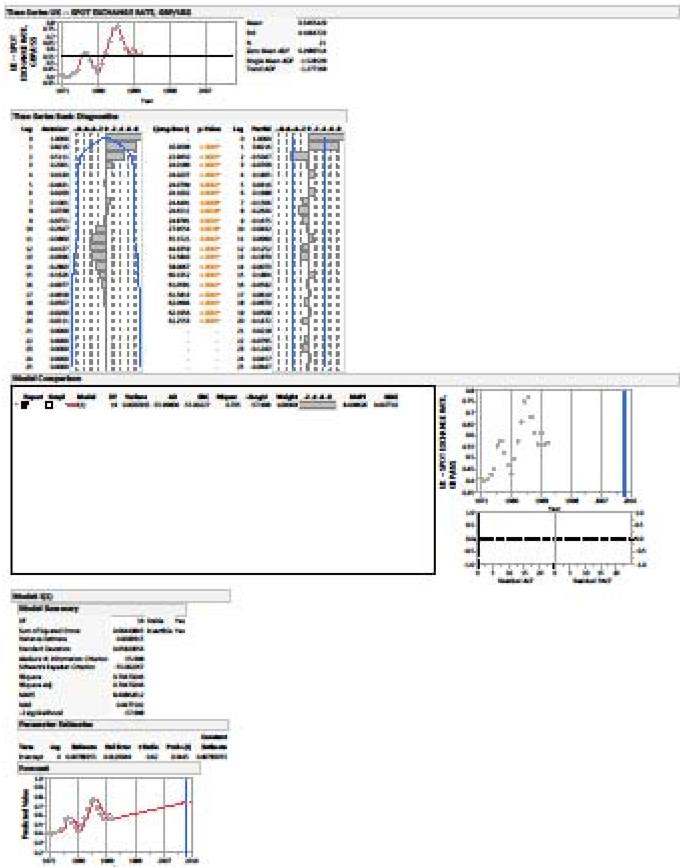


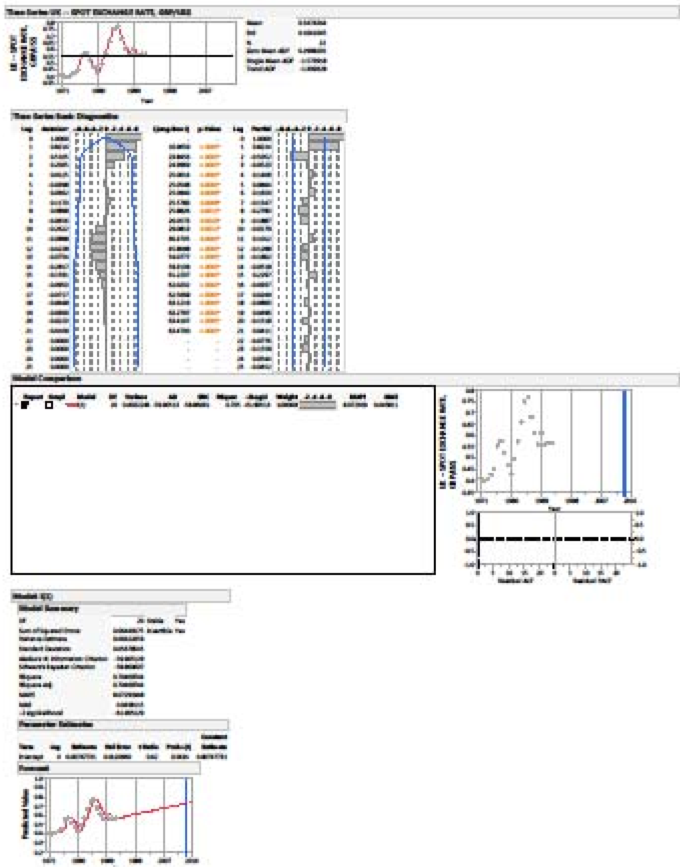


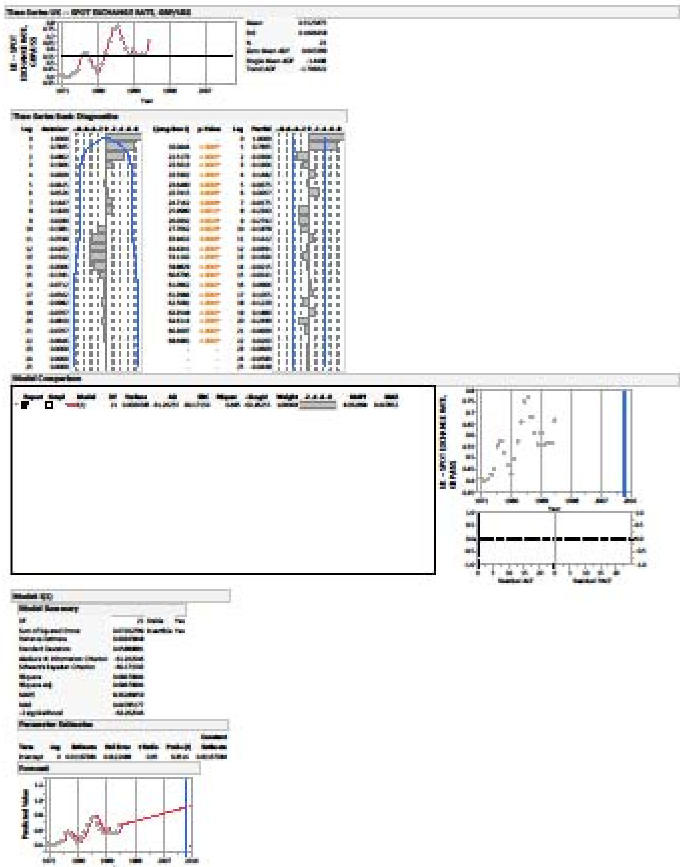


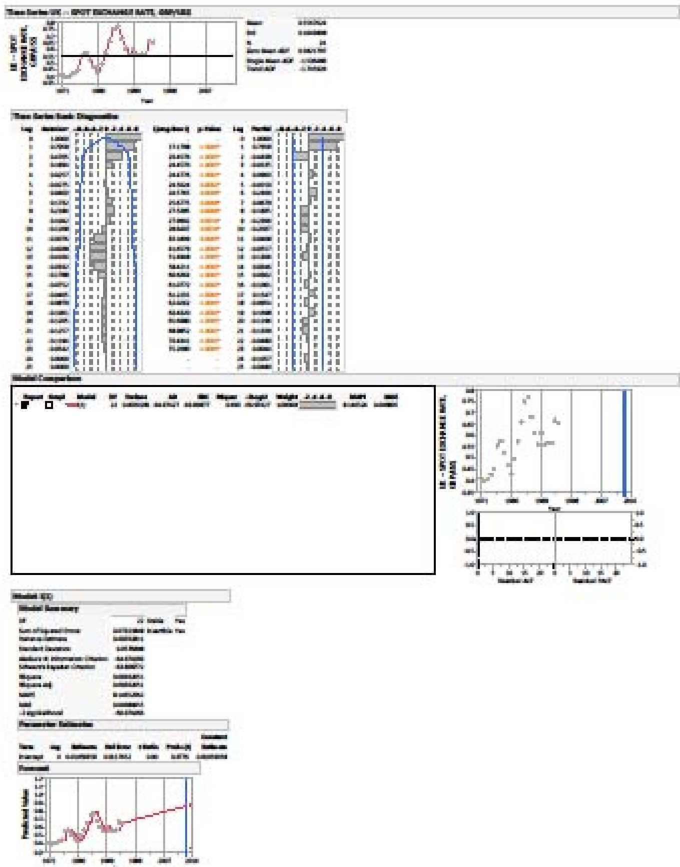


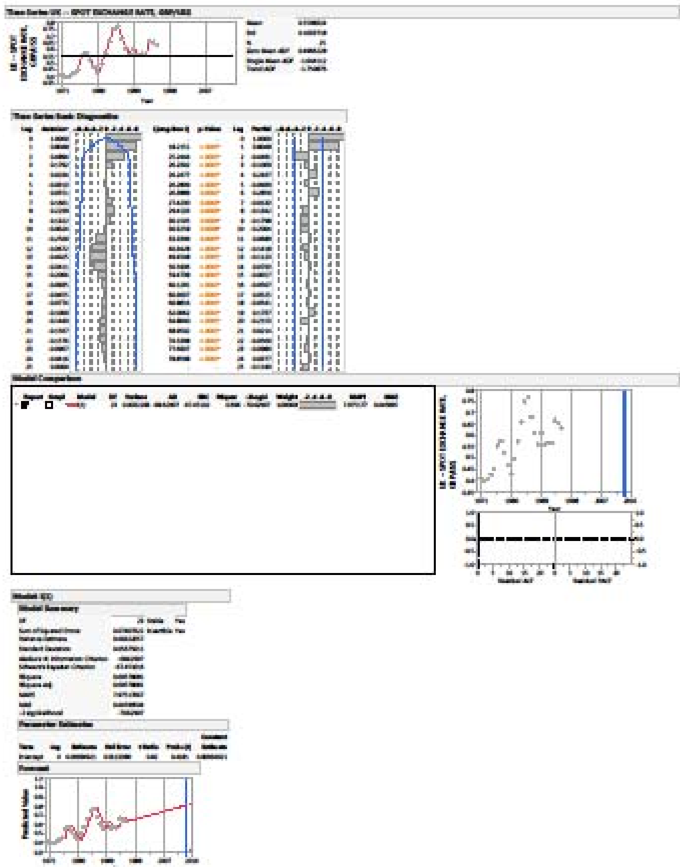




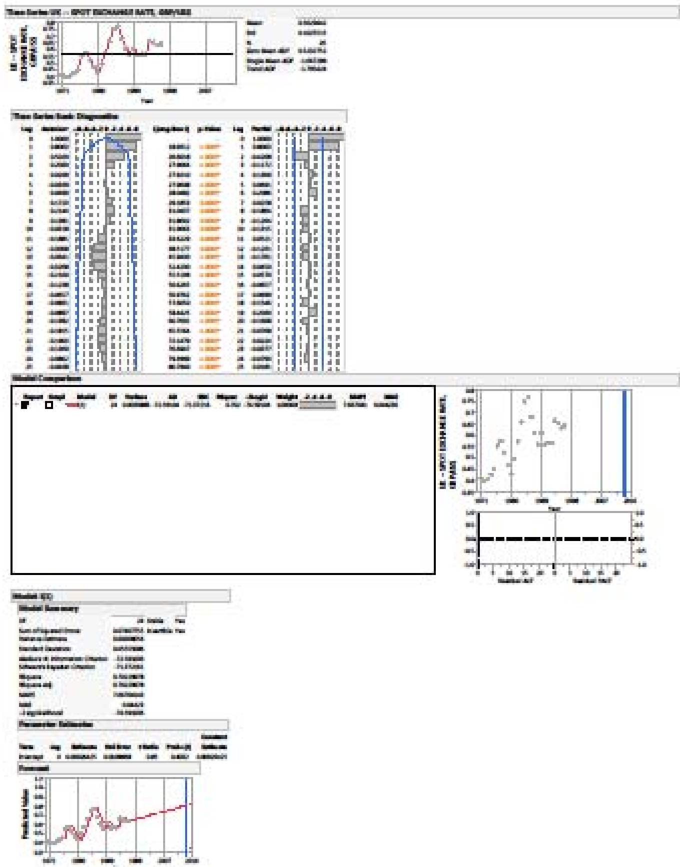


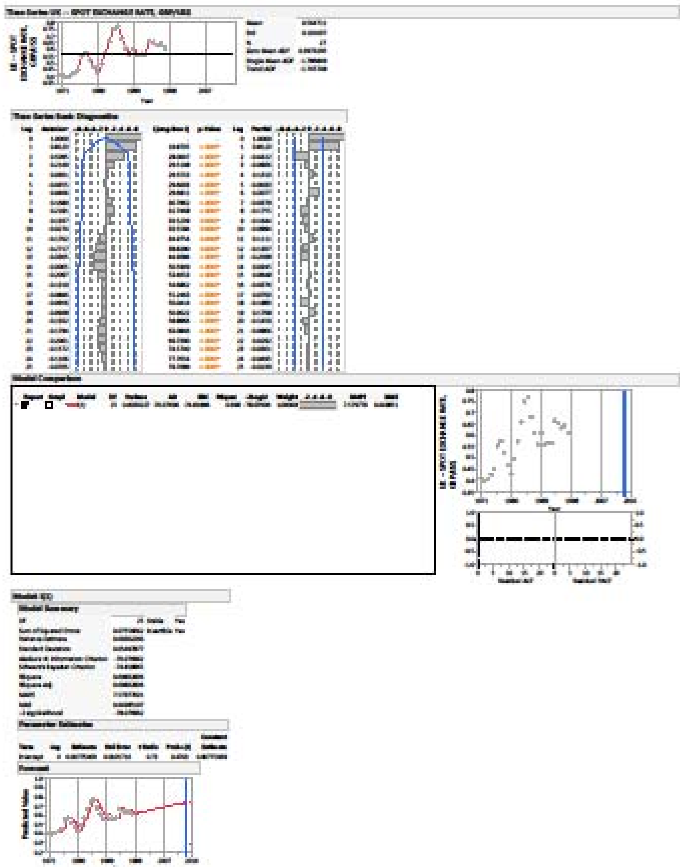


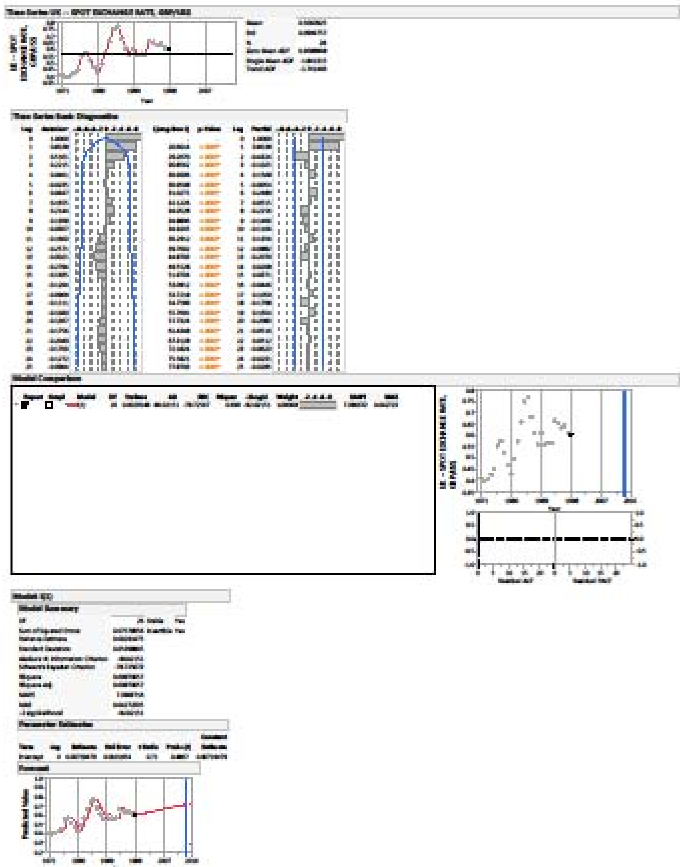


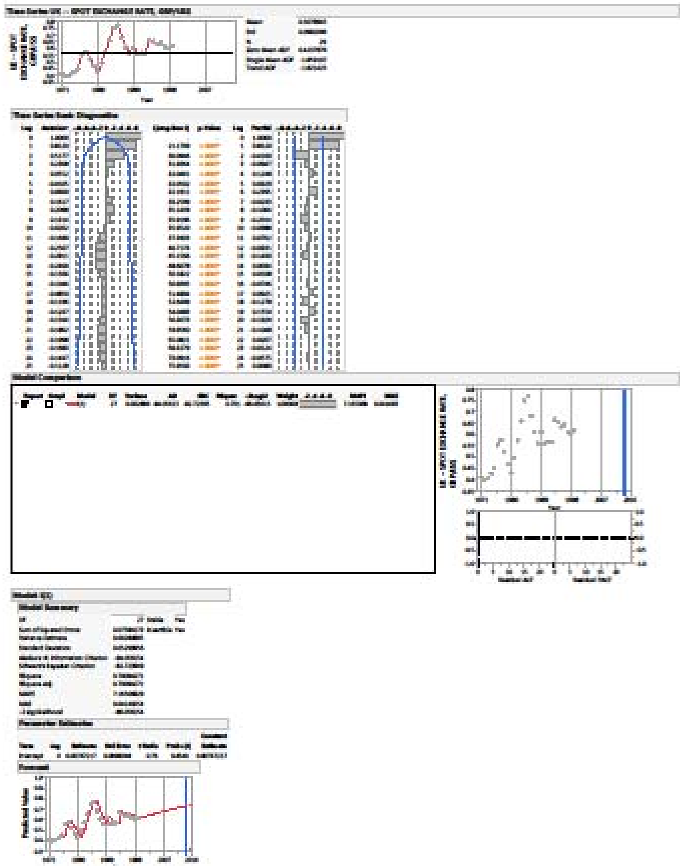


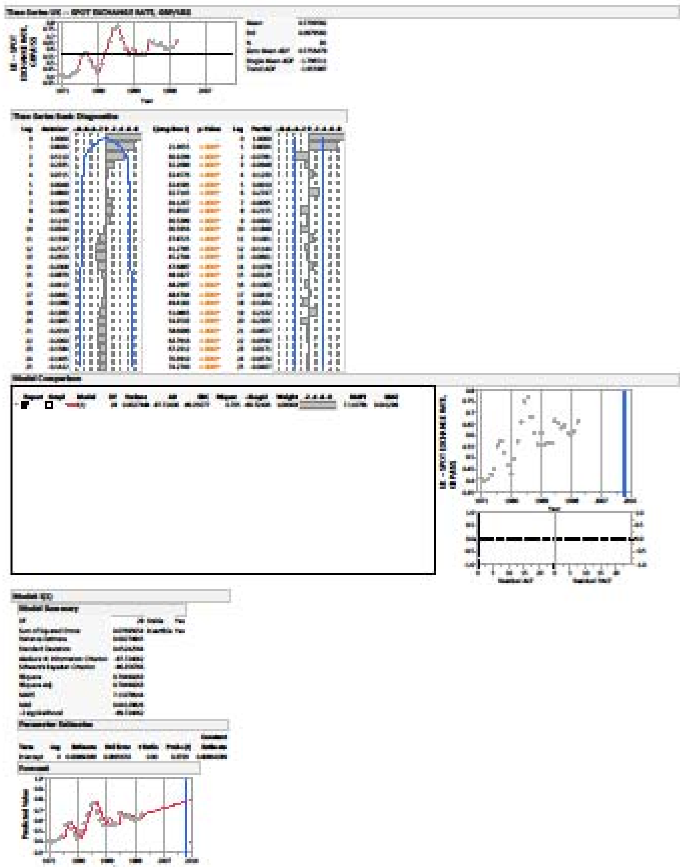
UK - Time Series of UK -- SPOT EXCHANGE RATE, GBP/US$ 8

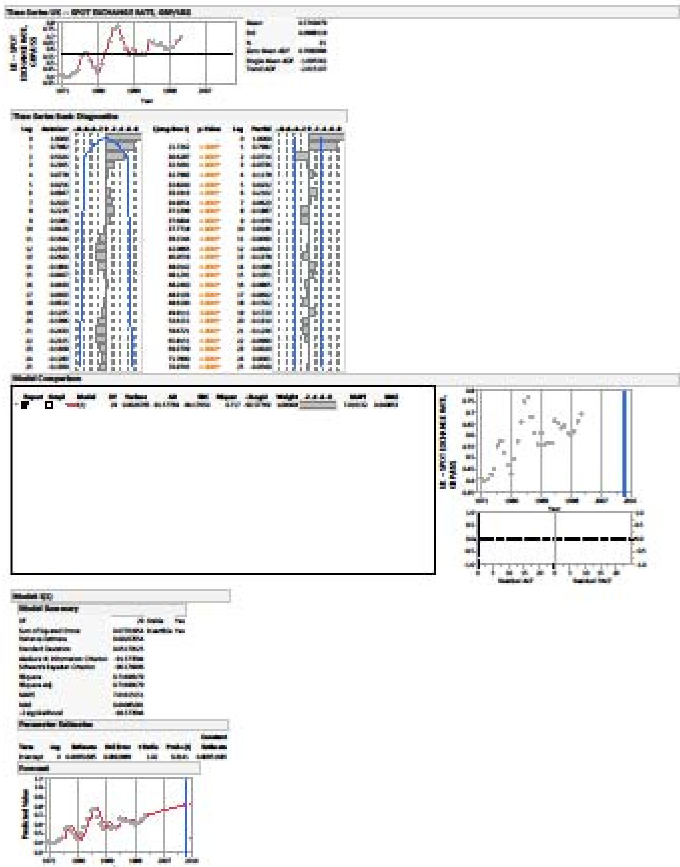


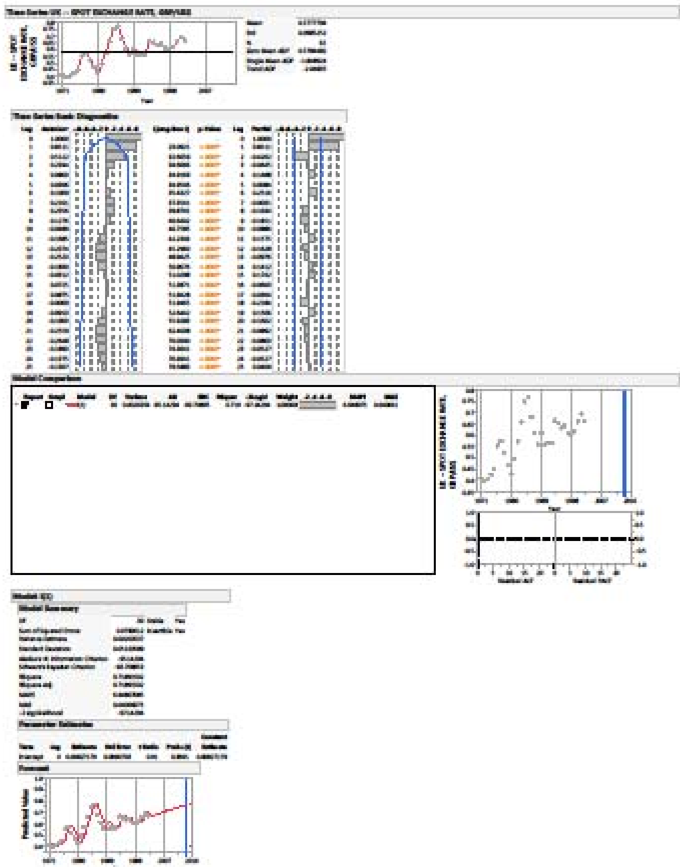




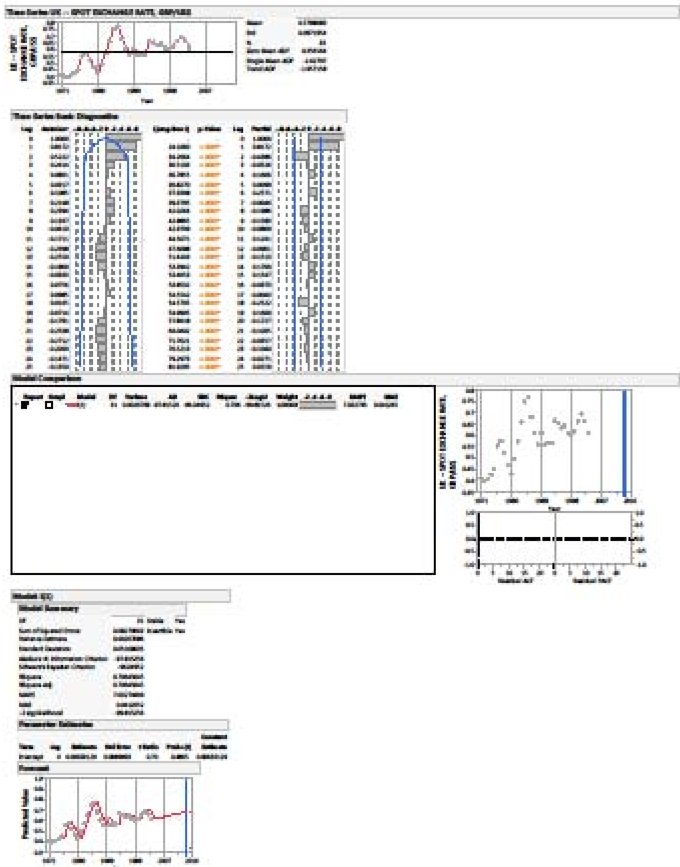


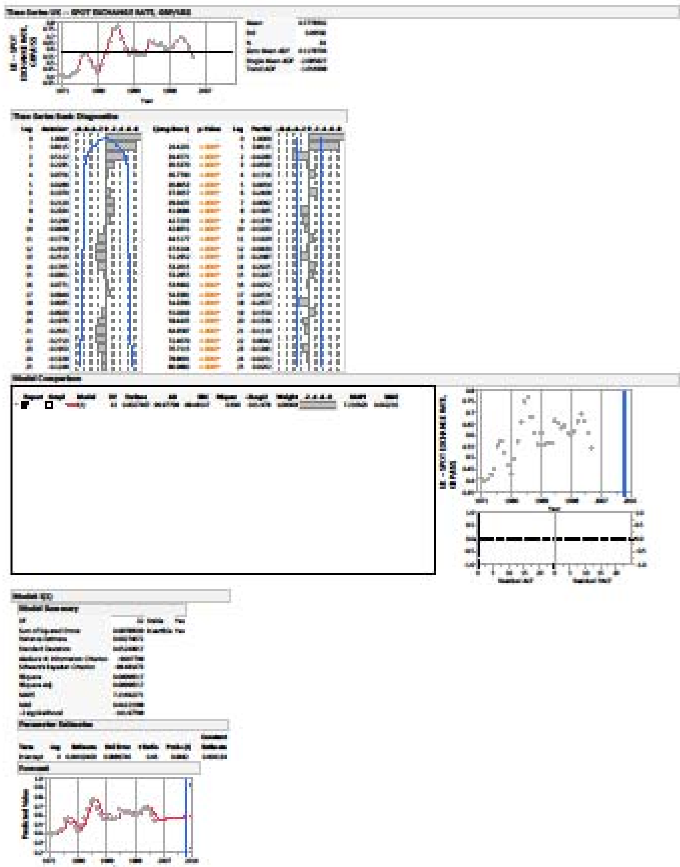


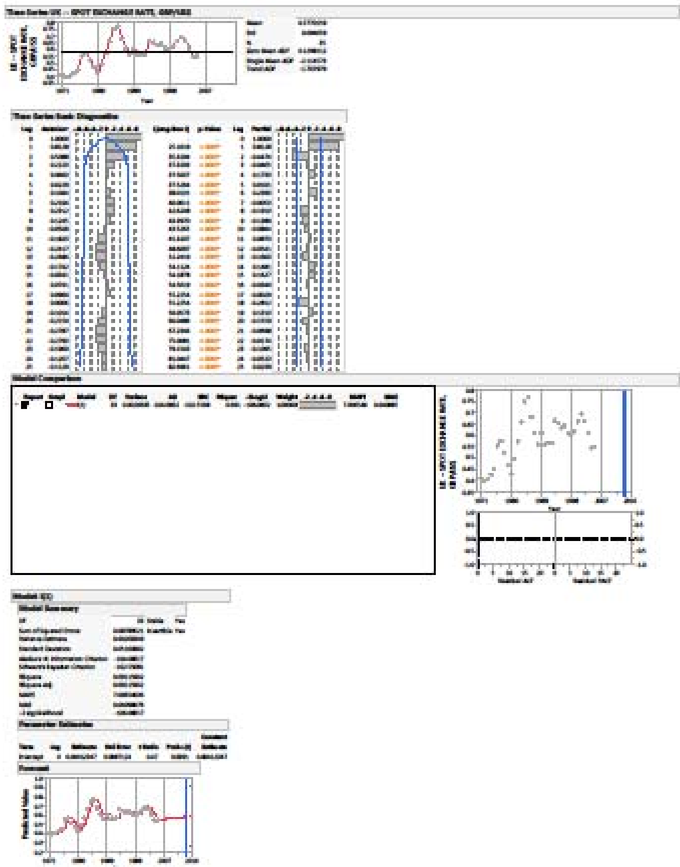


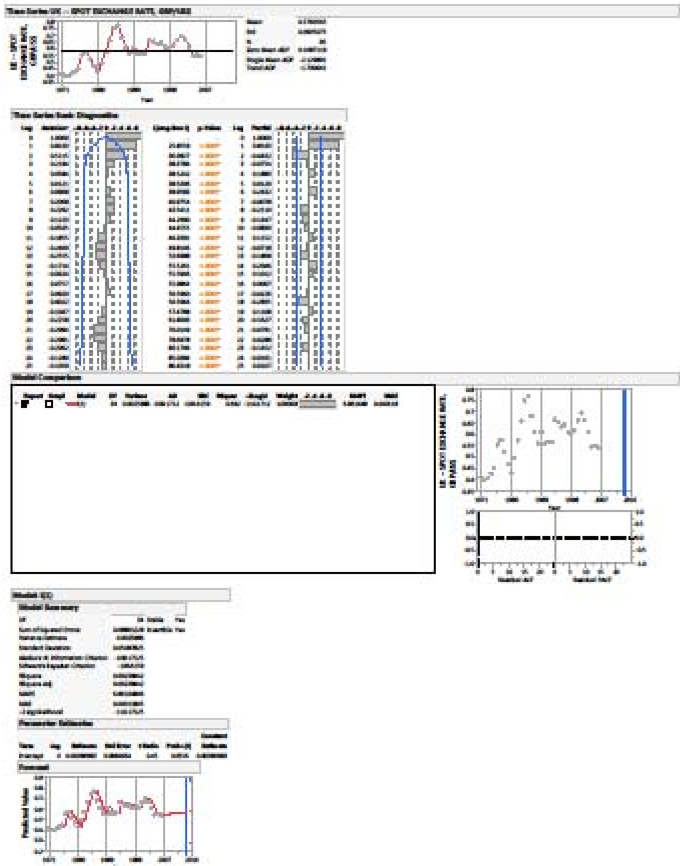


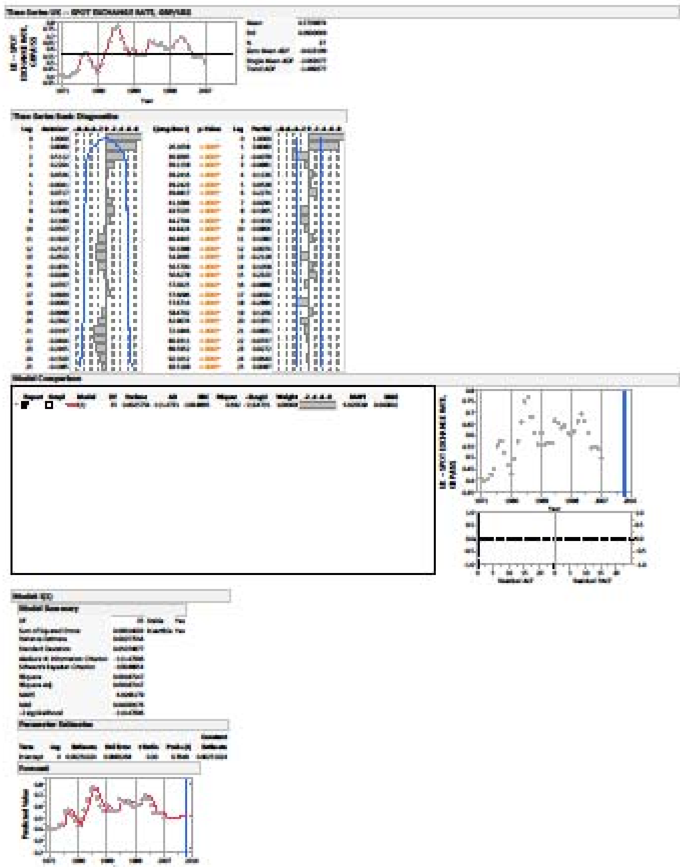
UK - Time Series of UK -- SPOT EXCHANGE RATE, GBP/US$ 5

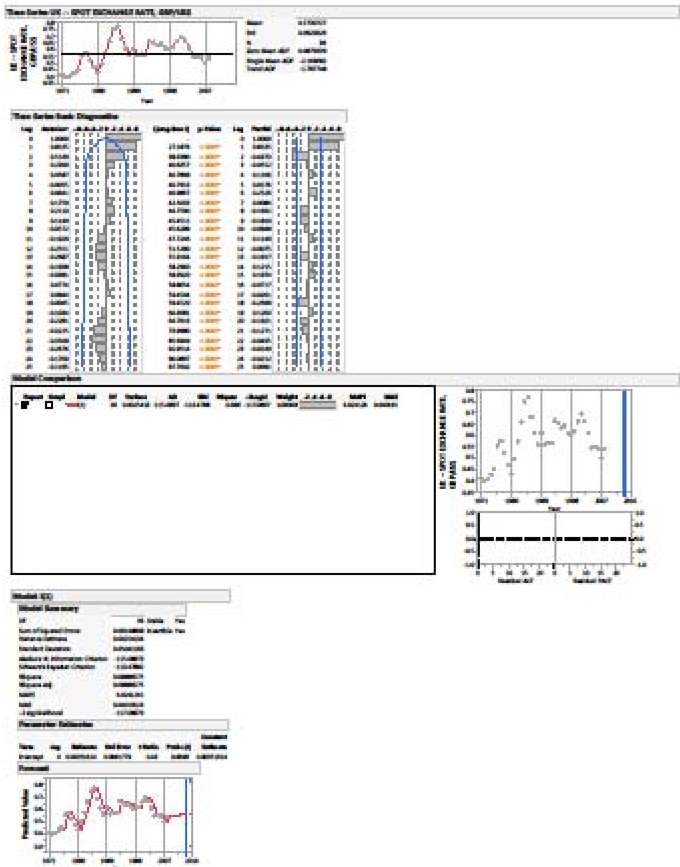




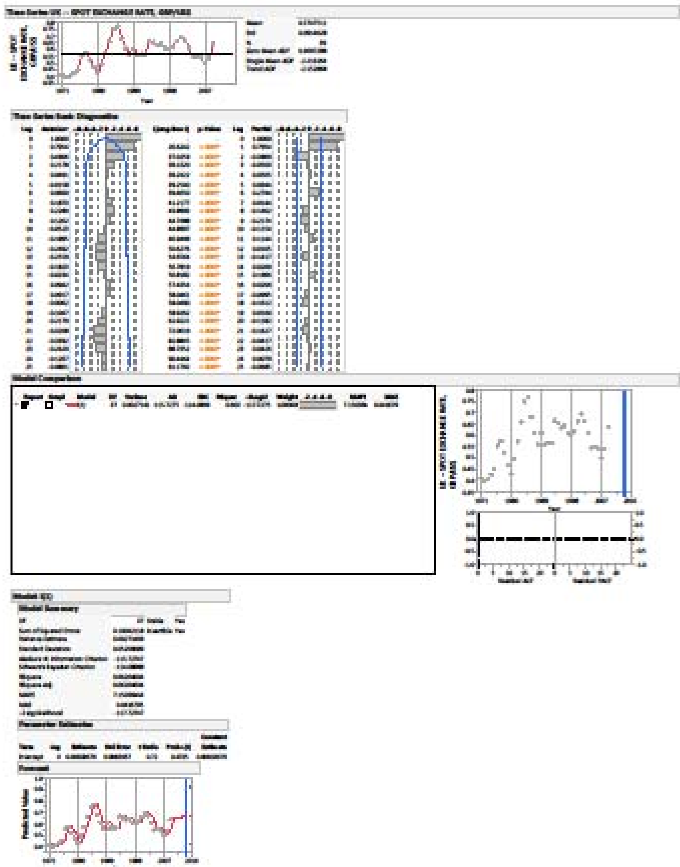


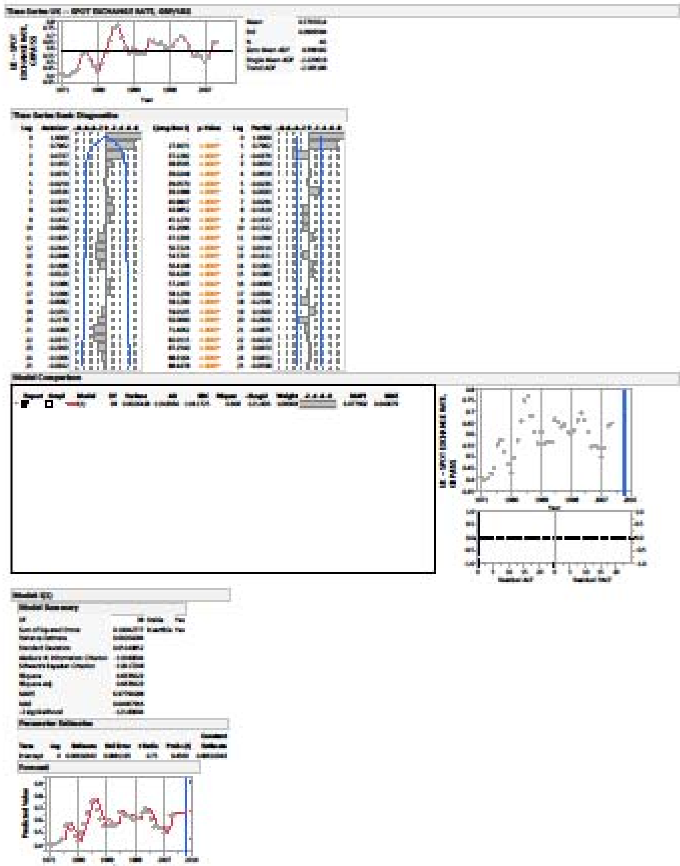






UK - Time Series of UK -- SPOT EXCHANGE RATE, GBP/US$ 11





Appendix E: OSD (Comptroller) Adjusting Rates

			O&M Budget Rate		MILCON & FH Budget Rate			
	Country	Monetary Unit	Dollars to Foreign Currency	Foreign Currency to Dollars	Dollars to Foreign Currency	Foreign Currency to Dollars	Adjusting Rate in Dollars	Adjusting Rate in Foreign Currency
For Month Ended 9/30/2014	DENMARK	KRONE	0.1751896	5.7081	0.1751896	5.7081	0.169262	5.908
	EUROPEAN UNION	EURO	1.3063357	0.7655	1.3063357	0.7655	1.261034	0.793
	ICELAND	KRONA	0.0081387	122.8694	0.0081387	122.8694	0.008259	121.08
	JAPAN	YEN	0.0096206	103.9439	0.0096206	103.9439	0.0091241	109.6
	NORWAY	KRONE	0.1741584	5.7419	0.1741584	5.7419	0.155159	6.445
	SINGAPORE	DOLLAR	0.8057368	1.2411	0.8057368	1.2411	0.7843137	1.275
	SOUTH KOREA	WON	0.0009045	1105.592	0.0009045	1105.592	0.0009483	1054.55
	TURKEY	LIRA	0.5563282	1.7975	0.5563282	1.7975	0.4389816	2.278
	UNITED KINGDOM	POUND	1.5281174	0.6544	1.5281174	0.6544	1.618123	0.618
For Month Ended 8/31/2014	DENMARK	KRONE	0.1751896	5.7081	0.1751896	5.7081	0.1768972	5.653
	EUROPEAN UNION	EURO	1.3063357	0.7655	1.3063357	0.7655	1.3192612	0.758
	ICELAND	KRONA	0.0081387	122.8694	0.0081387	122.8694	0.0085756	116.61
	JAPAN	YEN	0.0096206	103.9439	0.0096206	103.9439	0.0096283	103.86
	NORWAY	KRONE	0.1741584	5.7419	0.1741584	5.7419	0.1617599	6.182
	SINGAPORE	DOLLAR	0.8057368	1.2411	0.8057368	1.2411	0.8019246	1.247
	SOUTH KOREA	WON	0.0009045	1105.592	0.0009045	1105.592	0.0009864	1013.75
	TURKEY	LIRA	0.5563282	1.7975	0.5563282	1.7975	0.4640371	2.155
	UNITED KINGDOM	POUND	1.5281174	0.6544	1.5281174	0.6544	1.6611296	0.602
For Month Ended 7/31/2014	DENMARK	KRONE	0.1751896	5.7081	0.1751896	5.7081	0.1795332	5.57
	EUROPEAN UNION	EURO	1.3063357	0.7655	1.3063357	0.7655	1.3386881	0.747
	ICELAND	KRONA	0.0081387	122.8694	0.0081387	122.8694	0.0086919	115.05
	JAPAN	YEN	0.0096206	103.9439	0.0096206	103.9439	0.0097229	102.85
	NORWAY	KRONE	0.1741584	5.7419	0.1741584	5.7419	0.1593118	6.277
	SINGAPORE	DOLLAR	0.8057368	1.2411	0.8057368	1.2411	0.8019246	1.247
	SOUTH KOREA	WON	0.0009045	1105.592	0.0009045	1105.592	0.000973	1027.75
	TURKEY	LIRA	0.5563282	1.7975	0.5563282	1.7975	0.4686036	2.134
	UNITED KINGDOM	POUND	1.5281174	0.6544	1.5281174	0.6544	1.6891892	0.592
For Month Ended 6/30/2014	DENMARK	KRONE	0.1751896	5.7081	0.1751896	5.7081	0.1831166	5.461
	EUROPEAN UNION	EURO	1.3063357	0.7655	1.3063357	0.7655	1.3661202	0.732
	ICELAND	KRONA	0.0081387	122.8694	0.0081387	122.8694	0.0088763	112.66
	JAPAN	YEN	0.0096206	103.9439	0.0096206	103.9439	0.0098629	101.39
	NORWAY	KRONE	0.1741584	5.7419	0.1741584	5.7419	0.1623377	6.16

	SINGAPORE	DOLLAR	0.8057368	1.2411	0.8057368	1.2411	0.8006405	1.249
	SOUTH KOREA	WON	0.0009045	1105.592	0.0009045	1105.592	0.0009886	1011.5
	TURKEY	LIRA	0.5563282	1.7975	0.5563282	1.7975	0.4708098	2.124
	UNITED KINGDOM	POUND	1.5281174	0.6544	1.5281174	0.6544	1.7006803	0.588
For Month Ended 5/31/2014	DENMARK	KRONE	0.1751896	5.7081	0.1751896	5.7081	0.1823819	5.483
	EUROPEAN UNION	EURO	1.3063357	0.7655	1.3063357	0.7655	1.3605442	0.735
	ICELAND	KRONA	0.0081387	122.8694	0.0081387	122.8694	0.008859	112.88
	JAPAN	YEN	0.0096206	103.9439	0.0096206	103.9439	0.0098377	101.65
	NORWAY	KRONE	0.1741584	5.7419	0.1741584	5.7419	0.1672241	5.98
	SINGAPORE	DOLLAR	0.8057368	1.2411	0.8057368	1.2411	0.7980846	1.253
	SOUTH KOREA	WON	0.0009045	1105.592	0.0009045	1105.592	0.0009804	1019.95
	TURKEY	LIRA	0.5563282	1.7975	0.5563282	1.7975	0.4782401	2.091
	UNITED KINGDOM	POUND	1.5281174	0.6544	1.5281174	0.6544	1.6722408	0.598
For Month Ended 4/30/2014	DENMARK	KRONE	0.1751896	5.7081	0.1751896	5.7081	0.1852538	5.398
	EUROPEAN UNION	EURO	1.3063357	0.7655	1.3063357	0.7655	1.3831259	0.723
	ICELAND	KRONA	0.0081387	122.8694	0.0081387	122.8694	0.0089158	112.16
	JAPAN	YEN	0.0096206	103.9439	0.0096206	103.9439	0.0097494	102.57
	NORWAY	KRONE	0.1741584	5.7419	0.1741584	5.7419	0.1675884	5.967
	SINGAPORE	DOLLAR	0.8057368	1.2411	0.8057368	1.2411	0.7961783	1.256
	SOUTH KOREA	WON	0.0009045	1105.592	0.0009045	1105.592	0.0009682	1032.85
	TURKEY	LIRA	0.5563282	1.7975	0.5563282	1.7975	0.4725898	2.116
	UNITED KINGDOM	POUND	1.5281174	0.6544	1.5281174	0.6544	1.6835017	0.594
For Month Ended 3/31/2014	DENMARK	KRONE	0.1849318	5.4074	0.1849318	5.4074	0.1846722	5.415
	EUROPEAN UNION	EURO	1.3776002	0.7259	1.3776002	0.7259	1.3793103	0.725
	ICELAND	KRONA	0.0087276	114.5787	0.0087276	114.5787	0.008881	112.6
	JAPAN	YEN	0.0122384	81.7098	0.0122384	81.7098	0.0096834	103.27
	NORWAY	KRONE	0.1704681	5.8662	0.1704681	5.8662	0.1669449	5.99
	SINGAPORE	DOLLAR	0.7601672	1.3155	0.7601672	1.3155	0.7936508	1.26
	SOUTH KOREA	WON	0.0008766	1140.786	0.0008766	1140.786	0.0009393	1064.65
	TURKEY	LIRA	0.6214654	1.6091	0.6214654	1.6091	0.464684	2.152
	UNITED KINGDOM	POUND	1.6189089	0.6177	1.6189089	0.6177	1.6638935	0.601
For Month Ended 2/28/2014	DENMARK	KRONE	0.1849318	5.4074	0.1849318	5.4074	0.1848429	5.41
	EUROPEAN UNION	EURO	1.3776002	0.7259	1.3776002	0.7259	1.3793103	0.725
	ICELAND	KRONA	0.0087276	114.5787	0.0087276	114.5787	0.0088992	112.37
	JAPAN	YEN	0.0122384	81.7098	0.0122384	81.7098	0.0098155	101.88
	NORWAY	KRONE	0.1704681	5.8662	0.1704681	5.8662	0.1666667	6
	SINGAPORE	DOLLAR	0.7601672	1.3155	0.7601672	1.3155	0.7898894	1.266
	SOUTH KOREA	WON	0.0008766	1140.786	0.0008766	1140.786	0.0009383	1065.71
	TURKEY	LIRA	0.6214654	1.6091	0.6214654	1.6091	0.4512635	2.216
	UNITED KINGDOM	POUND	1.6189089	0.6177	1.6189089	0.6177	1.6694491	0.599
For Month	DENMARK	KRONE	0.1849318	5.4074	0.1849318	5.4074	0.1815871	5.507

Ended 1/31/2014	EUROPEAN UNION	EURO	1.3776002	0.7259	1.3776002	0.7259	1.3550136	0.738
	ICELAND	KRONA	0.0087276	114.5787	0.0087276	114.5787	0.0086453	115.67
	JAPAN	YEN	0.0122384	81.7098	0.0122384	81.7098	0.0097847	102.2
	NORWAY	KRONE	0.1704681	5.8662	0.1704681	5.8662	0.1591596	6.283
	SINGAPORE	DOLLAR	0.7601672	1.3155	0.7601672	1.3155	0.7818608	1.279
	SOUTH KOREA	WON	0.0008766	1140.786	0.0008766	1140.786	0.0009256	1080.36
	TURKEY	LIRA	0.6214654	1.6091	0.6214654	1.6091	0.4378284	2.284
	UNITED KINGDOM	POUND	1.6189089	0.6177	1.6189089	0.6177	1.6447368	0.608
For Month Ended 12/31/2013	DENMARK	KRONE	0.1849318	5.4074	0.1849318	5.4074	0.1845359	5.419
	EUROPEAN UNION	EURO	1.3776002	0.7259	1.3776002	0.7259	1.3774105	0.726
	ICELAND	KRONA	0.0087276	114.5787	0.0087276	114.5787	0.0086934	115.03
	JAPAN	YEN	0.0122384	81.7098	0.0122384	81.7098	0.0095229	105.01
	NORWAY	KRONE	0.1704681	5.8662	0.1704681	5.8662	0.1643926	6.083
	SINGAPORE	DOLLAR	0.7601672	1.3155	0.7601672	1.3155	0.7917656	1.263
	SOUTH KOREA	WON	0.0008766	1140.786	0.0008766	1140.786	0.0009476	1055.25
	TURKEY	LIRA	0.6214654	1.6091	0.6214654	1.6091	0.4681648	2.136
	UNITED KINGDOM	POUND	1.6189089	0.6177	1.6189089	0.6177	1.6528926	0.605
For Month Ended 11/30/2013	DENMARK	KRONE	0.1849318	5.4074	0.1849318	5.4074	0.1824818	5.48
	EUROPEAN UNION	EURO	1.3776002	0.7259	1.3776002	0.7259	1.3605442	0.735
	ICELAND	KRONA	0.0087276	114.5787	0.0087276	114.5787	0.0083907	119.18
	JAPAN	YEN	0.0122384	81.7098	0.0122384	81.7098	0.0097742	102.31
	NORWAY	KRONE	0.1704681	5.8662	0.1704681	5.8662	0.1630523	6.133
	SINGAPORE	DOLLAR	0.7601672	1.3155	0.7601672	1.3155	0.7961783	1.256
	SOUTH KOREA	WON	0.0008766	1140.786	0.0008766	1140.786	0.0009454	1057.76
	TURKEY	LIRA	0.6214654	1.6091	0.6214654	1.6091	0.4945598	2.022
	UNITED KINGDOM	POUND	1.6189089	0.6177	1.6189089	0.6177	1.6339869	0.612
For Month Ended 10/31/2013	DENMARK	KRONE	0.1849318	5.4074	0.1849318	5.4074	0.1831166	5.461
	EUROPEAN UNION	EURO	1.3776002	0.7259	1.3776002	0.7259	1.3661202	0.732
	ICELAND	KRONA	0.0087276	114.5787	0.0087276	114.5787	0.0083181	120.22
	JAPAN	YEN	0.0122384	81.7098	0.0122384	81.7098	0.0101823	98.21
	NORWAY	KRONE	0.1704681	5.8662	0.1704681	5.8662	0.1685204	5.934
	SINGAPORE	DOLLAR	0.7601672	1.3155	0.7601672	1.3155	0.8071025	1.239
	SOUTH KOREA	WON	0.0008766	1140.786	0.0008766	1140.786	0.0009439	1059.44
	TURKEY	LIRA	0.6214654	1.6091	0.6214654	1.6091	0.5027652	1.989
	UNITED KINGDOM	POUND	1.6189089	0.6177	1.6189089	0.6177	1.6025641	0.624
For Month Ended 9/30/2013	DENMARK	KRONE	0.1853362	5.3956	0.1853362	5.3956	0.1809955	5.525
	EUROPEAN UNION	EURO	1.3810247	0.7241	1.3810247	0.7241	1.3495277	0.741
	ICELAND	KRONA	0.0093553	106.8909	0.0093553	106.8909	0.0082706	120.91
	JAPAN	YEN	0.0121354	82.4035	0.0121354	82.4035	0.0102239	97.81
	NORWAY	KRONE	0.1684579	5.9362	0.1684579	5.9362	0.1663894	6.01
	SINGAPORE	DOLLAR	0.7511455	1.3313	0.7511455	1.3313	0.7961783	1.256

	SOUTH KOREA	WON	0.0009131	1095.164	0.0009131	1095.164	0.0009314	1073.7
	TURKEY	LIRA	0.6892749	1.4508	0.6892749	1.4508	0.4906771	2.038
	UNITED KINGDOM	POUND	1.6826519	0.5943	1.6826519	0.5943	1.6155089	0.619
For Month Ended 8/31/2013	DENMARK	KRONE	0.1853362	5.3956	0.1853362	5.3956	0.1774623	5.635
	EUROPEAN UNION	EURO	1.3810247	0.7241	1.3810247	0.7241	1.3227513	0.756
	ICELAND	KRONA	0.0093553	106.8909	0.0093553	106.8909	0.0083389	119.92
	JAPAN	YEN	0.0121354	82.4035	0.0121354	82.4035	0.0101926	98.11
	NORWAY	KRONE	0.1684579	5.9362	0.1684579	5.9362	0.1636393	6.111
	SINGAPORE	DOLLAR	0.7511455	1.3313	0.7511455	1.3313	0.7849294	1.274
	SOUTH KOREA	WON	0.0009131	1095.164	0.0009131	1095.164	0.0009011	1109.75
	TURKEY	LIRA	0.6892749	1.4508	0.6892749	1.4508	0.490918	2.037
	UNITED KINGDOM	POUND	1.6826519	0.5943	1.6826519	0.5943	1.5479876	0.646
For Month Ended 7/31/2013	DENMARK	KRONE	0.1853362	5.3956	0.1853362	5.3956	0.1778726	5.622
	EUROPEAN UNION	EURO	1.3810247	0.7241	1.3810247	0.7241	1.3262599	0.754
	ICELAND	KRONA	0.0093553	106.8909	0.0093553	106.8909	0.0083977	119.08
	JAPAN	YEN	0.0121354	82.4035	0.0121354	82.4035	0.0102375	97.68
	NORWAY	KRONE	0.1684579	5.9362	0.1684579	5.9362	0.1684069	5.938
	SINGAPORE	DOLLAR	0.7511455	1.3313	0.7511455	1.3313	0.7861635	1.272
	SOUTH KOREA	WON	0.0009131	1095.164	0.0009131	1095.164	0.0008916	1121.62
	TURKEY	LIRA	0.6892749	1.4508	0.6892749	1.4508	0.5181347	1.93
	UNITED KINGDOM	POUND	1.6826519	0.5943	1.6826519	0.5943	1.5197568	0.658
For Month Ended 6/30/2013	DENMARK	KRONE	0.1853362	5.3956	0.1853362	5.3956	0.1778726	5.622
	EUROPEAN UNION	EURO	1.3810247	0.7241	1.3810247	0.7241	1.3262599	0.754
	ICELAND	KRONA	0.0093553	106.8909	0.0093553	106.8909	0.0083977	119.08
	JAPAN	YEN	0.0121354	82.4035	0.0121354	82.4035	0.0102375	97.68
	NORWAY	KRONE	0.1684579	5.9362	0.1684579	5.9362	0.1684069	5.938
	SINGAPORE	DOLLAR	0.7511455	1.3313	0.7511455	1.3313	0.7861635	1.272
	SOUTH KOREA	WON	0.0009131	1095.164	0.0009131	1095.164	0.0008916	1121.62
	TURKEY	LIRA	0.6892749	1.4508	0.6892749	1.4508	0.5181347	1.93
	UNITED KINGDOM	POUND	1.6826519	0.5943	1.6826519	0.5943	1.5197568	0.658
For Month Ended 5/31/2013	DENMARK	KRONE	0.1853362	5.3956	0.1853362	5.3956	0.174125	5.743
	EUROPEAN UNION	EURO	1.3810247	0.7241	1.3810247	0.7241	1.2987013	0.77
	ICELAND	KRONA	0.0093553	106.8909	0.0093553	106.8909	0.0081486	122.72
	JAPAN	YEN	0.0121354	82.4035	0.0121354	82.4035	0.0099453	100.55
	NORWAY	KRONE	0.1684579	5.9362	0.1684579	5.9362	0.1702128	5.875
	SINGAPORE	DOLLAR	0.7511455	1.3313	0.7511455	1.3313	0.7911392	1.264
	SOUTH KOREA	WON	0.0009131	1095.164	0.0009131	1095.164	0.0008845	1130.55
	TURKEY	LIRA	0.6892749	1.4508	0.6892749	1.4508	0.5299417	1.887
	UNITED KINGDOM	POUND	1.6826519	0.5943	1.6826519	0.5943	1.5197568	0.658
For Month Ended 4/30/2013	DENMARK	KRONE	0.1853362	5.3956	0.1853362	5.3956	0.1752848	5.705
	EUROPEAN UNION	EURO	1.3810247	0.7241	1.3810247	0.7241	1.3071895	0.765

	ICELAND	KRONA	0.0093553	106.8909	0.0093553	106.8909	0.0085587	116.84
	JAPAN	YEN	0.0121354	82.4035	0.0121354	82.4035	0.0102501	97.56
	NORWAY	KRONE	0.1684579	5.9362	0.1684579	5.9362	0.1716444	5.826
	SINGAPORE	DOLLAR	0.7511455	1.3313	0.7511455	1.3313	0.81103	1.233
	SOUTH KOREA	WON	0.0009131	1095.164	0.0009131	1095.164	0.0009078	1101.52
	TURKEY	LIRA	0.6892749	1.4508	0.6892749	1.4508	0.5561735	1.798
	UNITED KINGDOM	POUND	1.6826519	0.5943	1.6826519	0.5943	1.5479876	0.646
For Month Ended 3/31/2013	DENMARK	KRONE	0.1853362	5.3956	0.1853362	5.3956	0.1752848	5.705
	EUROPEAN UNION	EURO	1.3810247	0.7241	1.3810247	0.7241	1.3071895	0.765
	ICELAND	KRONA	0.0093553	106.8909	0.0093553	106.8909	0.0085587	116.84
	JAPAN	YEN	0.0121354	82.4035	0.0121354	82.4035	0.0102501	97.56
	NORWAY	KRONE	0.1684579	5.9362	0.1684579	5.9362	0.1716444	5.826
	SINGAPORE	DOLLAR	0.7511455	1.3313	0.7511455	1.3313	0.81103	1.233
	SOUTH KOREA	WON	0.0009131	1095.164	0.0009131	1095.164	0.0009078	1101.52
	TURKEY	LIRA	0.6892749	1.4508	0.6892749	1.4508	0.5561735	1.798
	UNITED KINGDOM	POUND	1.6826519	0.5943	1.6826519	0.5943	1.5479876	0.646
For Month Ended 2/28/2013	DENMARK	KRONE	0.1853362	5.3956	0.1853362	5.3956	0.1759324	5.684
	EUROPEAN UNION	EURO	1.3810247	0.7241	1.3810247	0.7241	1.312336	0.762
	ICELAND	KRONA	0.0093553	106.8909	0.0093553	106.8909	0.0079605	125.62
	JAPAN	YEN	0.0121354	82.4035	0.0121354	82.4035	0.0108578	92.1
	NORWAY	KRONE	0.1684579	5.9362	0.1684579	5.9362	0.1751313	5.71
	SINGAPORE	DOLLAR	0.7511455	1.3313	0.7511455	1.3313	0.8084074	1.237
	SOUTH KOREA	WON	0.0009131	1095.164	0.0009131	1095.164	0.0009228	1083.7
	TURKEY	LIRA	0.6892749	1.4508	0.6892749	1.4508	0.5574136	1.794
	UNITED KINGDOM	POUND	1.6826519	0.5943	1.6826519	0.5943	1.5197568	0.658
For Month Ended 1/31/2013	DENMARK	KRONE	0.1853362	5.3956	0.1853362	5.3956	0.1759324	5.684
	EUROPEAN UNION	EURO	1.3810247	0.7241	1.3810247	0.7241	1.312336	0.762
	ICELAND	KRONA	0.0093553	106.8909	0.0093553	106.8909	0.0079605	125.62
	JAPAN	YEN	0.0121354	82.4035	0.0121354	82.4035	0.0108578	92.1
	NORWAY	KRONE	0.1684579	5.9362	0.1684579	5.9362	0.1751313	5.71
	SINGAPORE	DOLLAR	0.7511455	1.3313	0.7511455	1.3313	0.8084074	1.237
	SOUTH KOREA	WON	0.0009131	1095.164	0.0009131	1095.164	0.0009228	1083.7
	TURKEY	LIRA	0.6892749	1.4508	0.6892749	1.4508	0.5574136	1.794
	UNITED KINGDOM	POUND	1.6826519	0.5943	1.6826519	0.5943	1.5197568	0.658
For Month Ended 12/31/2012	DENMARK	KRONE	0.1853362	5.3956	0.1853362	5.3956	0.1766784	5.66
	EUROPEAN UNION	EURO	1.3810247	0.7241	1.3810247	0.7241	1.3175231	0.759
	ICELAND	KRONA	0.0093553	106.8909	0.0093553	106.8909	0.0078119	128.01
	JAPAN	YEN	0.0121354	82.4035	0.0121354	82.4035	0.0116063	86.16
	NORWAY	KRONE	0.1684579	5.9362	0.1684579	5.9362	0.1790831	5.584
	SINGAPORE	DOLLAR	0.7511455	1.3313	0.7511455	1.3313	0.8183306	1.222
	SOUTH KOREA	WON	0.0009131	1095.164	0.0009131	1095.164	0.0009405	1063.24

	TURKEY	LIRA	0.6892749	1.4508	0.6892749	1.4508	0.5599104	1.786
	UNITED KINGDOM	POUND	1.6826519	0.5943	1.6826519	0.5943	1.618123	0.618
For Month Ended 11/30/2012	DENMARK	KRONE	0.1853362	5.3956	0.1853362	5.3956	0.1766784	5.66
	EUROPEAN UNION	EURO	1.3810247	0.7241	1.3810247	0.7241	1.3175231	0.759
	ICELAND	KRONA	0.0093553	106.8909	0.0093553	106.8909	0.0078119	128.01
	JAPAN	YEN	0.0121354	82.4035	0.0121354	82.4035	0.0116063	86.16
	NORWAY	KRONE	0.1684579	5.9362	0.1684579	5.9362	0.1790831	5.584
	SINGAPORE	DOLLAR	0.7511455	1.3313	0.7511455	1.3313	0.8183306	1.222
	SOUTH KOREA	WON	0.0009131	1095.164	0.0009131	1095.164	0.0009405	1063.24
	TURKEY	LIRA	0.6892749	1.4508	0.6892749	1.4508	0.5599104	1.786
	UNITED KINGDOM	POUND	1.6826519	0.5943	1.6826519	0.5943	1.618123	0.618
For Month Ended 10/31/2012	DENMARK	KRONE	0.1853362	5.3956	0.1853362	5.3956	0.1766784	5.66
	EUROPEAN UNION	EURO	1.3810247	0.7241	1.3810247	0.7241	1.3175231	0.759
	ICELAND	KRONA	0.0093553	106.8909	0.0093553	106.8909	0.0078119	128.01
	JAPAN	YEN	0.0121354	82.4035	0.0121354	82.4035	0.0116063	86.16
	NORWAY	KRONE	0.1684579	5.9362	0.1684579	5.9362	0.1790831	5.584
	SINGAPORE	DOLLAR	0.7511455	1.3313	0.7511455	1.3313	0.8183306	1.222
	SOUTH KOREA	WON	0.0009131	1095.164	0.0009131	1095.164	0.0009405	1063.24
	TURKEY	LIRA	0.6892749	1.4508	0.6892749	1.4508	0.5599104	1.786
	UNITED KINGDOM	POUND	1.6826519	0.5943	1.6826519	0.5943	1.618123	0.618
For Month Ended 9/30/2012	DENMARK	KRONE	0.1791505	5.5819	0.1791505	5.5819	0.1736413	5.759
	EUROPEAN UNION	EURO	1.3349353	0.7491	1.3349353	0.7491	1.2936611	0.773
	ICELAND	KRONA	0.0094995	105.2688	0.0094995	105.2688	0.0081024	123.42
	JAPAN	YEN	0.0109586	91.2524	0.0109586	91.2524	0.0128766	77.66
	NORWAY	KRONE	0.1641901	6.0905	0.1641901	6.0905	0.1757778	5.689
	SINGAPORE	DOLLAR	0.7019514	1.4246	0.7019514	1.4246	0.8163265	1.225
	SOUTH KOREA	WON	0.0009095	1099.518	0.0009095	1099.518	0.0008992	1112.04
	TURKEY	LIRA	0.7072636	1.4139	0.7072636	1.4139	0.5574136	1.794
	UNITED KINGDOM	POUND	1.6900456	0.5917	1.6900456	0.5917	1.6207455	0.617
For Month Ended 8/31/2012	DENMARK	KRONE	0.1791505	5.5819	0.1791505	5.5819	0.1686625	5.929
	EUROPEAN UNION	EURO	1.3349353	0.7491	1.3349353	0.7491	1.2562814	0.796
	ICELAND	KRONA	0.0094995	105.2688	0.0094995	105.2688	0.0081974	121.99
	JAPAN	YEN	0.0109586	91.2524	0.0109586	91.2524	0.0127356	78.52
	NORWAY	KRONE	0.1641901	6.0905	0.1641901	6.0905	0.1723544	5.802
	SINGAPORE	DOLLAR	0.7019514	1.4246	0.7019514	1.4246	0.8006405	1.249
	SOUTH KOREA	WON	0.0009095	1,099.52	0.0009095	1099.518	0.0008822	1133.59
	TURKEY	LIRA	0.7072636	1.4139	0.7072636	1.4139	0.550055	1.818
	UNITED KINGDOM	POUND	1.6900456	0.5917	1.6900456	0.5917	1.5822785	0.632
For Month Ended 7/31/2012	DENMARK	KRONE	0.1791505	5.5819	0.1791505	5.5819	0.16518	6.054
	EUROPEAN UNION	EURO	1.3349353	0.7491	1.3349353	0.7491	1.2285012	0.814
	ICELAND	KRONA	0.0094995	105.2688	0.0094995	105.2688	0.0082795	120.78

	JAPAN	YEN	0.0109586	91.2524	0.0109586	91.2524	0.012791	78.18
	NORWAY	KRONE	0.1641901	6.0905	0.1641901	6.0905	0.1656452	6.037
	SINGAPORE	DOLLAR	0.7019514	1.4246	0.7019514	1.4246	0.8045052	1.243
	SOUTH KOREA	WON	0.0009095	1099.518	0.0009095	1099.518	0.0008847	1130.27
	TURKEY	LIRA	0.7072636	1.4139	0.7072636	1.4139	0.5571031	1.795
	UNITED KINGDOM	POUND	1.6900456	0.5917	1.6900456	0.5917	1.5698587	0.637
For Month Ended 6/30/2012	DENMARK	KRONE	0.1791505	5.5819	0.1791505	5.5819	0.1691475	5.912
	EUROPEAN UNION	EURO	1.3349353	0.7491	1.3349353	0.7491	1.2578616	0.795
	ICELAND	KRONA	0.0094995	105.2688	0.0094995	105.2688	0.0079567	125.68
	JAPAN	YEN	0.0109586	91.2524	0.0109586	91.2524	0.0125834	79.47
	NORWAY	KRONE	0.1641901	6.0905	0.1641901	6.0905	0.1669449	5.99
	SINGAPORE	DOLLAR	0.7019514	1.4246	0.7019514	1.4246	0.7880221	1.269
	SOUTH KOREA	WON	0.0009095	1099.518	0.0009095	1099.518	0.000873	1145.51
	TURKEY	LIRA	0.7072636	1.4139	0.7072636	1.4139	0.5503577	1.817
	UNITED KINGDOM	POUND	1.6900456	0.5917	1.6900456	0.5917	1.5600624	0.641
For Month Ended 5/31/2012	DENMARK	KRONE	0.1791505	5.5819	0.1791505	5.5819	0.1691475	5.912
	EUROPEAN UNION	EURO	1.3349353	0.7491	1.3349353	0.7491	1.2578616	0.795
	ICELAND	KRONA	0.0094995	105.2688	0.0094995	105.2688	0.0079567	125.68
	JAPAN	YEN	0.0109586	91.2524	0.0109586	91.2524	0.0125834	79.47
	NORWAY	KRONE	0.1641901	6.0905	0.1641901	6.0905	0.1669449	5.99
	SINGAPORE	DOLLAR	0.7019514	1.4246	0.7019514	1.4246	0.7880221	1.269
	SOUTH KOREA	WON	0.0009095	1099.518	0.0009095	1099.518	0.000873	1145.51
	TURKEY	LIRA	0.7072636	1.4139	0.7072636	1.4139	0.5503577	1.817
	UNITED KINGDOM	POUND	1.6900456	0.5917	1.6900456	0.5917	1.5600624	0.641
For Month Ended 4/30/2012	DENMARK	KRONE	0.1791505	5.5819	0.1791505	5.5819	0.1776514	5.629
	EUROPEAN UNION	EURO	1.3349353	0.7491	1.3349353	0.7491	1.321004	0.757
	ICELAND	KRONA	0.0094995	105.2688	0.0094995	105.2688	0.0079491	125.8
	JAPAN	YEN	0.0109586	91.2524	0.0109586	91.2524	0.0124735	80.17
	NORWAY	KRONE	0.1641901	6.0905	0.1641901	6.0905	0.174216	5.74
	SINGAPORE	DOLLAR	0.7019514	1.4246	0.7019514	1.4246	0.8090615	1.236
	SOUTH KOREA	WON	0.0009095	1099.518	0.0009095	1099.518	0.0008862	1128.36
	TURKEY	LIRA	0.7072636	1.4139	0.7072636	1.4139	0.5694761	1.756
	UNITED KINGDOM	POUND	1.6900456	0.5917	1.6900456	0.5917	1.6260163	0.615
For Month Ended 3/31/2012	DENMARK	KRONE	0.1791505	5.5819	0.1791505	5.5819	0.1794366	5.573
	EUROPEAN UNION	EURO	1.3349353	0.7491	1.3349353	0.7491	1.3351135	0.749
	ICELAND	KRONA	0.0094995	105.2688	0.0094995	105.2688	0.0079177	126.3
	JAPAN	YEN	0.0109586	91.2524	0.0109586	91.2524	0.0121862	82.06
	NORWAY	KRONE	0.1641901	6.0905	0.1641901	6.0905	0.175716	5.691
	SINGAPORE	DOLLAR	0.7019514	1.4246	0.7019514	1.4246	0.7955449	1.257
	SOUTH KOREA	WON	0.0009095	1099.518	0.0009095	1099.518	0.0008827	1132.9
	TURKEY	LIRA	0.7072636	1.4139	0.7072636	1.4139	0.5614823	1.781

	UNITED KINGDOM	POUND	1.6900456	0.5917	1.6900456	0.5917	1.6	0.625
For Month Ended 2/29/2012	DENMARK	KRONE	0.1791505	5.5819	0.1791505	5.5819	0.1807011	5.534
	EUROPEAN UNION	EURO	1.3349353	0.7491	1.3349353	0.7491	1.344086	0.744
	ICELAND	KRONA	0.0094995	105.2688	0.0094995	105.2688	0.0080354	124.45
	JAPAN	YEN	0.0109586	91.2524	0.0109586	91.2524	0.0124285	80.46
	NORWAY	KRONE	0.1641901	6.0905	0.1641901	6.0905	0.1804403	5.542
	SINGAPORE	DOLLAR	0.7019514	1.4246	0.7019514	1.4246	0.8038585	1.244
	SOUTH KOREA	WON	0.0009095	1,099.52	0.0009095	1099.518	0.0008961	1115.95
	TURKEY	LIRA	0.7072636	1.4139	0.7072636	1.4139	0.5737235	1.743
	UNITED KINGDOM	POUND	1.6900456	0.5917	1.6900456	0.5917	1.5923567	0.628
For Month Ended 1/31/2012	DENMARK	KRONE	0.1791505	5.5819	0.1791505	5.5819	0.1773679	5.638
	EUROPEAN UNION	EURO	1.3349353	0.7491	1.3349353	0.7491	1.3192612	0.758
	ICELAND	KRONA	0.0094995	105.2688	0.0094995	105.2688	0.0081473	122.74
	JAPAN	YEN	0.0109586	91.2524	0.0109586	91.2524	0.0130941	76.37
	NORWAY	KRONE	0.1641901	6.0905	0.1641901	6.0905	0.172206	5.807
	SINGAPORE	DOLLAR	0.7019514	1.4246	0.7019514	1.4246	0.798722	1.252
	SOUTH KOREA	WON	0.0009095	1,099.52	0.0009095	1099.518	0.0008925	1120.5
	TURKEY	LIRA	0.7072636	1.4139	0.7072636	1.4139	0.5656109	1.768
	UNITED KINGDOM	POUND	1.6900456	0.5917	1.6900456	0.5917	1.5772871	0.634
For Month Ended 12/31/2011	DENMARK	KRONE	0.1791505	5.5819	0.1791505	5.5819	0.174125	5.743
	EUROPEAN UNION	EURO	1.3349353	0.7491	1.3349353	0.7491	1.2936611	0.773
	ICELAND	KRONA	0.0094995	105.2688	0.0094995	105.2688	0.0081633	122.5
	JAPAN	YEN	0.0109586	91.2524	0.0109586	91.2524	0.0129316	77.33
	NORWAY	KRONE	0.1641901	6.0905	0.1641901	6.0905	0.1665556	6.004
	SINGAPORE	DOLLAR	0.7019514	1.4246	0.7019514	1.4246	0.7698229	1.299
	SOUTH KOREA	WON	0.0009095	1099.518	0.0009095	1099.518	0.0008631	1158.65
	TURKEY	LIRA	0.7072636	1.4139	0.7072636	1.4139	0.5302227	1.886
	UNITED KINGDOM	POUND	1.6900456	0.5917	1.6900456	0.5917	1.5479876	0.646
For Month Ended 11/30/2011	DENMARK	KRONE	0.1791505	5.5819	0.1791505	5.5819	0.1790831	5.584
	EUROPEAN UNION	EURO	1.3349353	0.7491	1.3349353	0.7491	1.3315579	0.751
	ICELAND	KRONA	0.0094995	105.2688	0.0094995	105.2688	0.0083493	119.77
	JAPAN	YEN	0.0109586	91.2524	0.0109586	91.2524	0.0128156	78.03
	NORWAY	KRONE	0.1641901	6.0905	0.1641901	6.0905	0.171409	5.834
	SINGAPORE	DOLLAR	0.7019514	1.4246	0.7019514	1.4246	0.7739938	1.292
	SOUTH KOREA	WON	0.0009095	1099.518	0.0009095	1099.518	0.0008768	1140.55
	TURKEY	LIRA	0.7072636	1.4139	0.7072636	1.4139	0.5411255	1.848
	UNITED KINGDOM	POUND	1.6900456	0.5917	1.6900456	0.5917	1.5625	0.64
For Month Ended 10/31/2011	DENMARK	KRONE	0.1791505	5.5819	0.1791505	5.5819	0.1882176	5.313
	EUROPEAN UNION	EURO	1.3349353	0.7491	1.3349353	0.7491	1.4005602	0.714
	ICELAND	KRONA	0.0094995	105.2688	0.0094995	105.2688	0.0088013	113.62
	JAPAN	YEN	0.0109586	91.2524	0.0109586	91.2524	0.012837	77.9

	NORWAY	KRONE	0.1641901	6.0905	0.1641901	6.0905	0.1816201	5.506
	SINGAPORE	DOLLAR	0.7019514	1.4246	0.7019514	1.4246	0.8012821	1.248
	SOUTH KOREA	WON	0.0009095	1,099.52	0.0009095	1099.518	0.0009009	1110.05
	TURKEY	LIRA	0.7072636	1.4139	0.7072636	1.4139	0.5707763	1.752
	UNITED KINGDOM	POUND	1.6900456	0.5917	1.6900456	0.5917	1.6025641	0.624
For Month Ended 9/30/2011	DENMARK	KRONE	0.1860984	5.3735	0.1860984	5.3735	0.1816201	5.506
	EUROPEAN UNION	EURO	1.3865779	0.7212	1.3865779	0.7212	1.3513514	0.74
	ICELAND	KRONA	0.0117322	85.2358	0.0117322	85.2358	0.0084854	117.85
	JAPAN	YEN	0.0098086	101.9517	0.0098086	101.9517	0.0130141	76.84
	NORWAY	KRONE	0.1631641	6.1288	0.1631641	6.1288	0.171409	5.834
	SINGAPORE	DOLLAR	0.6821748	1.4659	0.6821748	1.4659	0.770416	1.298
	SOUTH KOREA	WON	0.0008699	1149.506	0.0008699	1149.506	0.0008468	1180.9
	TURKEY	LIRA	0.7205649	1.3878	0.7205649	1.3878	0.5387931	1.856
	UNITED KINGDOM	POUND	1.7340038	0.5767	1.7340038	0.5767	1.5600624	0.641
For Month Ended 8/31/2011	DENMARK	KRONE	0.1860984	5.3735	0.1860984	5.3735	0.1937609	5.161
	EUROPEAN UNION	EURO	1.3865779	0.7212	1.3865779	0.7212	1.4430014	0.693
	ICELAND	KRONA	0.0117322	85.2358	0.0117322	85.2358	0.008837	113.16
	JAPAN	YEN	0.0098086	101.9517	0.0098086	101.9517	0.0130565	76.59
	NORWAY	KRONE	0.1631641	6.1288	0.1631641	6.1288	0.186846	5.352
	SINGAPORE	DOLLAR	0.6821748	1.4659	0.6821748	1.4659	0.8319468	1.202
	SOUTH KOREA	WON	0.0008699	1149.506	0.0008699	1149.506	0.0009387	1065.35
	TURKEY	LIRA	0.7205649	1.3878	0.7205649	1.3878	0.5803831	1.723
	UNITED KINGDOM	POUND	1.7340038	0.5767	1.7340038	0.5767	1.6286645	0.614
For Month Ended 7/30/2011	DENMARK	KRONE	0.1860984	5.3735	0.1860984	5.3735	0.1914242	5.224
	EUROPEAN UNION	EURO	1.3865779	0.7212	1.3865779	0.7212	1.4265335	0.701
	ICELAND	KRONA	0.0117322	85.2358	0.0117322	85.2358	0.0086498	115.61
	JAPAN	YEN	0.0098086	101.9517	0.0098086	101.9517	0.0128949	77.55
	NORWAY	KRONE	0.1631641	6.1288	0.1631641	6.1288	0.1842978	5.426
	SINGAPORE	DOLLAR	0.6821748	1.4659	0.6821748	1.4659	0.8298755	1.205
	SOUTH KOREA	WON	0.0008699	1149.506	0.0008699	1149.506	0.0009488	1054
	TURKEY	LIRA	0.7205649	1.3878	0.7205649	1.3878	0.5941771	1.683
	UNITED KINGDOM	POUND	1.7340038	0.5767	1.7340038	0.5767	1.6286645	0.614
For Month Ended 6/30/2011	DENMARK	KRONE	0.1860984	5.3735	0.1860984	5.3735	0.1939864	5.155
	EUROPEAN UNION	EURO	1.3865779	0.7212	1.3865779	0.7212	1.447178	0.691
	ICELAND	KRONA	0.0117322	85.2358	0.0117322	85.2358	0.008739	114.43
	JAPAN	YEN	0.0098086	101.9517	0.0098086	101.9517	0.0124378	80.4
	NORWAY	KRONE	0.1631641	6.1288	0.1631641	6.1288	0.1861504	5.372
	SINGAPORE	DOLLAR	0.6821748	1.4659	0.6821748	1.4659	0.8136697	1.229
	SOUTH KOREA	WON	0.0008699	1149.506	0.0008699	1149.506	0.0009368	1067.5
	TURKEY	LIRA	0.7205649	1.3878	0.7205649	1.3878	0.6169031	1.621
	UNITED KINGDOM	POUND	1.7340038	0.5767	1.7340038	0.5767	1.6025641	0.624

For Month Ended 5/31/2011	DENMARK	KRONE	0.1860984	5.3735	0.1860984	5.3735	0.1930129	5.181
	EUROPEAN UNION	EURO	1.3865779	0.7212	1.3865779	0.7212	1.4388489	0.695
	ICELAND	KRONA	0.0117322	85.2358	0.0117322	85.2358	0.0087131	114.77
	JAPAN	YEN	0.0098086	101.9517	0.0098086	101.9517	0.0122714	81.49
	NORWAY	KRONE	0.1631641	6.1288	0.1631641	6.1288	0.1855288	5.39
	SINGAPORE	DOLLAR	0.6821748	1.4659	0.6821748	1.4659	0.8103728	1.234
	SOUTH KOREA	WON	0.0008699	1149.506	0.0008699	1149.506	0.0009269	1078.9
	TURKEY	LIRA	0.7205649	1.3878	0.7205649	1.3878	0.6281407	1.592
	UNITED KINGDOM	POUND	1.7340038	0.5767	1.7340038	0.5767	1.650165	0.606
For Month Ended 4/30/2011	DENMARK	KRONE	0.1860984	5.3735	0.1860984	5.3735	0.1993223	5.017
	EUROPEAN UNION	EURO	1.3865779	0.7212	1.3865779	0.7212	1.4858841	0.673
	ICELAND	KRONA	0.0117322	85.2358	0.0117322	85.2358	0.0090367	110.66
	JAPAN	YEN	0.0098086	101.9517	0.0098086	101.9517	0.0123153	81.2
	NORWAY	KRONE	0.1631641	6.1288	0.1631641	6.1288	0.1910585	5.234
	SINGAPORE	DOLLAR	0.6821748	1.4659	0.6821748	1.4659	0.8163265	1.225
	SOUTH KOREA	WON	0.0008699	1149.506	0.0008699	1149.506	0.000936	1068.4
	TURKEY	LIRA	0.7205649	1.3878	0.7205649	1.3878	0.6583278	1.519
	UNITED KINGDOM	POUND	1.7340038	0.5767	1.7340038	0.5767	1.6666667	0.6
For Month Ended 3/31/2011	DENMARK	KRONE	0.1860984	5.3735	0.1860984	5.3735	0.1905488	5.248
	EUROPEAN UNION	EURO	1.3865779	0.7212	1.3865779	0.7212	1.4204545	0.704
	ICELAND	KRONA	0.0117322	85.2358	0.0117322	85.2358	0.0087781	113.92
	JAPAN	YEN	0.0098086	101.9517	0.0098086	101.9517	0.0120729	82.83
	NORWAY	KRONE	0.1631641	6.1288	0.1631641	6.1288	0.1812579	5.517
	SINGAPORE	DOLLAR	0.6821748	1.4659	0.6821748	1.4659	0.7936508	1.26
	SOUTH KOREA	WON	0.0008699	1149.506	0.0008699	1149.506	0.0009142	1093.8
	TURKEY	LIRA	0.7205649	1.3878	0.7205649	1.3878	0.6480881	1.543
	UNITED KINGDOM	POUND	1.7340038	0.5767	1.7340038	0.5767	1.610306	0.621
For Month Ended 2/28/2011	DENMARK	KRONE	0.1860984	5.3735	0.1860984	5.3735	0.1854943	5.391
	EUROPEAN UNION	EURO	1.3865779	0.7212	1.3865779	0.7212	1.3831259	0.723
	ICELAND	KRONA	0.0117322	85.2358	0.0117322	85.2358	0.0086311	115.86
	JAPAN	YEN	0.0098086	101.9517	0.0098086	101.9517	0.0122145	81.87
	NORWAY	KRONE	0.1631641	6.1288	0.1631641	6.1288	0.1788589	5.591
	SINGAPORE	DOLLAR	0.6821748	1.4659	0.6821748	1.4659	0.7867821	1.271
	SOUTH KOREA	WON	0.0008699	1149.506	0.0008699	1149.506	0.0008881	1126
	TURKEY	LIRA	0.7205649	1.3878	0.7205649	1.3878	0.6257822	1.598
	UNITED KINGDOM	POUND	1.7340038	0.5767	1.7340038	0.5767	1.6233766	0.616
For Month Ended 1/31/2011	DENMARK	KRONE	0.1860984	5.3735	0.1860984	5.3735	0.1836547	5.445
	EUROPEAN UNION	EURO	1.3865779	0.7212	1.3865779	0.7212	1.3679891	0.731
	ICELAND	KRONA	0.0117322	85.2358	0.0117322	85.2358	0.0086415	115.72
	JAPAN	YEN	0.0098086	101.9517	0.0098086	101.9517	0.0121743	82.14
	NORWAY	KRONE	0.1631641	6.1288	0.1631641	6.1288	0.1726817	5.791

	SINGAPORE	DOLLAR	0.6821748	1.4659	0.6821748	1.4659	0.78125	1.28
	SOUTH KOREA	WON	0.0008699	1149.506	0.0008699	1149.506	0.0008932	1119.6
	TURKEY	LIRA	0.7205649	1.3878	0.7205649	1.3878	0.622665	1.606
	UNITED KINGDOM	POUND	1.7340038	0.5767	1.7340038	0.5767	1.5898251	0.629
For Month Ended 12/31/2010	DENMARK	KRONE	0.1860984	5.3735	0.1860984	5.3735	0.1779043	5.621
	EUROPEAN UNION	EURO	1.3865779	0.7212	1.3865779	0.7212	1.3262599	0.754
	ICELAND	KRONA	0.0117322	85.2358	0.0117322	85.2358	0.0086558	115.53
	JAPAN	YEN	0.0098086	101.9517	0.0098086	101.9517	0.0122294	81.77
	NORWAY	KRONE	0.1631641	6.1288	0.1631641	6.1288	0.1695778	5.897
	SINGAPORE	DOLLAR	0.6821748	1.4659	0.6821748	1.4659	0.7757952	1.289
	SOUTH KOREA	WON	0.0008699	1149.506	0.0008699	1149.506	0.0008845	1130.6
	TURKEY	LIRA	0.7205649	1.3878	0.7205649	1.3878	0.643915	1.553
	UNITED KINGDOM	POUND	1.7340038	0.5767	1.7340038	0.5767	1.5384615	0.65
For Month Ended 11/30/2010	DENMARK	KRONE	0.1860984	5.3735	0.1860984	5.3735	0.1748557	5.719
	EUROPEAN UNION	EURO	1.3865779	0.7212	1.3865779	0.7212	1.303781	0.767
	ICELAND	KRONA	0.0117322	85.2358	0.0117322	85.2358	0.0085419	117.07
	JAPAN	YEN	0.0098086	101.9517	0.0098086	101.9517	0.0119289	83.83
	NORWAY	KRONE	0.1631641	6.1288	0.1631641	6.1288	0.1613163	6.199
	SINGAPORE	DOLLAR	0.6821748	1.4659	0.6821748	1.4659	0.7564297	1.322
	SOUTH KOREA	WON	0.0008699	1149.506	0.0008699	1149.506	0.000862	1160.15
	TURKEY	LIRA	0.7205649	1.3878	0.7205649	1.3878	0.6640106	1.506
	UNITED KINGDOM	POUND	1.7340038	0.5767	1.7340038	0.5767	1.552795	0.644
For Month Ended 10/31/2010	DENMARK	KRONE	0.1860984	5.3735	0.1860984	5.3735	0.1871608	5.343
	EUROPEAN UNION	EURO	1.3865779	0.7212	1.3865779	0.7212	1.3947	0.717
	ICELAND	KRONA	0.0117322	85.2358	0.0117322	85.2358	0.0090285	110.76
	JAPAN	YEN	0.0098086	101.9517	0.0098086	101.9517	0.0124425	80.37
	NORWAY	KRONE	0.1631641	6.1288	0.1631641	6.1288	0.1713209	5.837
	SINGAPORE	DOLLAR	0.6821748	1.4659	0.6821748	1.4659	0.7745933	1.291
	SOUTH KOREA	WON	0.0008699	1149.506	0.0008699	1149.506	0.0008953	1116.98
	TURKEY	LIRA	0.7205649	1.3878	0.7205649	1.3878	0.7012623	1.426
	UNITED KINGDOM	POUND	1.7340038	0.5767	1.7340038	0.5767	1.6051364	0.623
For Month Ended 9/30/2010	DENMARK	KRONE	0.1715178	5.8303	0.1715178	5.8303	0.1834189	5.452
	EUROPEAN UNION	EURO	1.2924906	0.7737	1.2924906	0.7737	1.3661202	0.732
	ICELAND	KRONA	0.0113496	88.1091	0.0113496	88.1091	0.0088394	113.13
	JAPAN	YEN	0.0091746	108.9969	0.0091746	108.9969	0.0120019	83.32
	NORWAY	KRONE	0.1577063	6.3409	0.1577063	6.3409	0.1710864	5.845
	SINGAPORE	DOLLAR	0.6593696	1.5166	0.6593696	1.5166	0.761035	1.314
	SOUTH KOREA	WON	0.0008392	1191.571	0.0008392	1191.571	0.0008771	1140.1
	TURKEY	LIRA	0.7203054	1.3883	0.7203054	1.3883	0.6915629	1.446
	UNITED KINGDOM	POUND	1.6934801	0.5905	1.6934801	0.5905	1.5898251	0.629
For Month	DENMARK	KRONE	0.1715178	5.8303	0.1715178	5.8303	0.1703287	5.871

Ended 8/31/2010	EUROPEAN UNION	EURO	1.2924906	0.7737	1.2924906	0.7737	1.2674271	0.789
	ICELAND	KRONA	0.0113496	88.1091	0.0113496	88.1091	0.0082843	120.71
	JAPAN	YEN	0.0091746	108.9969	0.0091746	108.9969	0.0118497	84.39
	NORWAY	KRONE	0.1577063	6.3409	0.1577063	6.3409	0.1580778	6.326
	SINGAPORE	DOLLAR	0.6593696	1.5166	0.6593696	1.5166	0.7374631	1.356
	SOUTH KOREA	WON	0.0008392	1191.571	0.0008392	1191.571	0.000834	1199.05
	TURKEY	LIRA	0.7203054	1.3883	0.7203054	1.3883	0.6540222	1.529
	UNITED KINGDOM	POUND	1.6934801	0.5905	1.6934801	0.5905	1.5384615	0.65
For Month Ended 7/31/2010	DENMARK	KRONE	0.1715178	5.8303	0.1715178	5.8303	0.1743071	5.737
	EUROPEAN UNION	EURO	1.2924906	0.7737	1.2924906	0.7737	1.2987013	0.77
	ICELAND	KRONA	0.0113496	88.1091	0.0113496	88.1091	0.0083167	120.24
	JAPAN	YEN	0.0091746	108.9969	0.0091746	108.9969	0.0115714	86.42
	NORWAY	KRONE	0.1577063	6.3409	0.1577063	6.3409	0.1630258	6.134
	SINGAPORE	DOLLAR	0.6593696	1.5166	0.6593696	1.5166	0.7342144	1.362
	SOUTH KOREA	WON	0.0008392	1191.571	0.0008392	1191.571	0.0008449	1183.55
	TURKEY	LIRA	0.7203054	1.3883	0.7203054	1.3883	0.6609385	1.513
	UNITED KINGDOM	POUND	1.6934801	0.5905	1.6934801	0.5905	1.55521	0.643
For Month Ended 6/30/2010	DENMARK	KRONE	0.1715178	5.8303	0.1715178	5.8303	0.1649893	6.061
	EUROPEAN UNION	EURO	1.2924906	0.7737	1.2924906	0.7737	1.2285012	0.814
	ICELAND	KRONA	0.0113496	88.1091	0.0113496	88.1091	0.0078567	127.28
	JAPAN	YEN	0.0091746	108.9969	0.0091746	108.9969	0.011279	88.66
	NORWAY	KRONE	0.1577063	6.3409	0.1577063	6.3409	0.1547748	6.461
	SINGAPORE	DOLLAR	0.6593696	1.5166	0.6593696	1.5166	0.7173601	1.394
	SOUTH KOREA	WON	0.0008392	1191.571	0.0008392	1191.571	0.0008186	1221.6
	TURKEY	LIRA	0.7203054	1.3883	0.7203054	1.3883	0.6337136	1.578
	UNITED KINGDOM	POUND	1.6934801	0.5905	1.6934801	0.5905	1.5037594	0.665
For Month Ended 5/31/2010	DENMARK	KRONE	0.1715178	5.8303	0.1715178	5.8303	0.1636393	6.111
	EUROPEAN UNION	EURO	1.2924906	0.7737	1.2924906	0.7737	1.216545	0.822
	ICELAND	KRONA	0.0113496	88.1091	0.0113496	88.1091	0.0077274	129.41
	JAPAN	YEN	0.0091746	108.9969	0.0091746	108.9969	0.0109842	91.04
	NORWAY	KRONE	0.1577063	6.3409	0.1577063	6.3409	0.1532097	6.527
	SINGAPORE	DOLLAR	0.6593696	1.5166	0.6593696	1.5166	0.7077141	1.413
	SOUTH KOREA	WON	0.0008392	1191.571	0.0008392	1191.571	0.0008224	1215.9
	TURKEY	LIRA	0.7203054	1.3883	0.7203054	1.3883	0.6309148	1.585
	UNITED KINGDOM	POUND	1.6934801	0.5905	1.6934801	0.5905	1.459854	0.685
For Month Ended 4/30/2010	DENMARK	KRONE	0.1715178	5.8303	0.1715178	5.8303	0.1789229	5.589
	EUROPEAN UNION	EURO	1.2924906	0.7737	1.2924906	0.7737	1.3315579	0.751
	ICELAND	KRONA	0.0113496	88.1091	0.0113496	88.1091	0.0078333	127.66
	JAPAN	YEN	0.0091746	108.9969	0.0091746	108.9969	0.0105775	94.54
	NORWAY	KRONE	0.1577063	6.3409	0.1577063	6.3409	0.1696641	5.894
	SINGAPORE	DOLLAR	0.6593696	1.5166	0.6593696	1.5166	0.7309942	1.368

	SOUTH KOREA	WON	0.0008392	1191.571	0.0008392	1191.571	0.0009024	1108.2
	TURKEY	LIRA	0.7203054	1.3883	0.7203054	1.3883	0.6747638	1.482
	UNITED KINGDOM	POUND	1.6934801	0.5905	1.6934801	0.5905	1.5337423	0.652
For Month Ended 3/31/2010	DENMARK	KRONE	0.1715178	5.8303	0.1715178	5.8303	0.1813894	5.513
	EUROPEAN UNION	EURO	1.2924906	0.7737	1.2924906	0.7737	1.3513514	0.74
	ICELAND	KRONA	0.0113496	88.1091	0.0113496	88.1091	0.0078284	127.74
	JAPAN	YEN	0.0091746	108.9969	0.0091746	108.9969	0.0107654	92.89
	NORWAY	KRONE	0.1577063	6.3409	0.1577063	6.3409	0.1684069	5.938
	SINGAPORE	DOLLAR	0.6593696	1.5166	0.6593696	1.5166	0.7153076	1.398
	SOUTH KOREA	WON	0.0008392	1191.571	0.0008392	1191.571	0.000884	1131.2
	TURKEY	LIRA	0.7203054	1.3883	0.7203054	1.3883	0.6574622	1.521
	UNITED KINGDOM	POUND	1.6934801	0.5905	1.6934801	0.5905	1.5128593	0.661
For Month Ended 2/28/2010	DENMARK	KRONE	0.1715178	5.8303	0.1715178	5.8303	0.1826818	5.474
	EUROPEAN UNION	EURO	1.2924906	0.7737	1.2924906	0.7737	1.3586957	0.736
	ICELAND	KRONA	0.0113496	88.1091	0.0113496	88.1091	0.0077961	128.27
	JAPAN	YEN	0.0091746	108.9969	0.0091746	108.9969	0.0112095	89.21
	NORWAY	KRONE	0.1577063	6.3409	0.1577063	6.3409	0.1688049	5.924
	SINGAPORE	DOLLAR	0.6593696	1.5166	0.6593696	1.5166	0.7112376	1.406
	SOUTH KOREA	WON	0.0008392	1191.571	0.0008392	1191.571	0.0008622	1159.8
	TURKEY	LIRA	0.7203054	1.3883	0.7203054	1.3883	0.6485084	1.542
	UNITED KINGDOM	POUND	1.6934801	0.5905	1.6934801	0.5905	1.52207	0.657
For Month Ended 1/31/2010	DENMARK	KRONE	0.1715178	5.8303	0.1715178	5.8303	0.1947238	5.1355
	EUROPEAN UNION	EURO	1.2924906	0.7737	1.2924906	0.7737	1.39078	0.719
	ICELAND	KRONA	0.0113496	88.1091	0.0113496	88.1091	0.0078339	127.65
	JAPAN	YEN	0.0091746	108.9969	0.0091746	108.9969	0.0110209	90.7364
	NORWAY	KRONE	0.1577063	6.3409	0.1577063	6.3409	0.1701242	5.8781
	SINGAPORE	DOLLAR	0.6593696	1.5166	0.6593696	1.5166	0.7084612	1.4115
	SOUTH KOREA	WON	0.0008392	1191.571	0.0008392	1191.571	0.0008578	1165.8
	TURKEY	LIRA	0.7203054	1.3883	0.7203054	1.3883	0.6729158	1.4861
	UNITED KINGDOM	POUND	1.6934801	0.5905	1.6934801	0.5905	1.5938211	0.6274
For Month Ended 12/31/2009	DENMARK	KRONE	0.1715178	5.8303	0.1715178	5.8303	0.1938612	5.1583
	EUROPEAN UNION	EURO	1.2924906	0.7737	1.2924906	0.7737	1.4424062	0.6933
	ICELAND	KRONA	0.0113496	88.1091	0.0113496	88.1091	0.008017	124.735
	JAPAN	YEN	0.0091746	108.9969	0.0091746	108.9969	0.0107891	92.6859
	NORWAY	KRONE	0.1577063	6.3409	0.1577063	6.3409	0.1757197	5.6909
	SINGAPORE	DOLLAR	0.6593696	1.5166	0.6593696	1.5166	0.7151746	1.3983
	SOUTH KOREA	WON	0.0008392	1191.571	0.0008392	1191.571	0.0008652	1155.8
	TURKEY	LIRA	0.7203054	1.3883	0.7203054	1.3883	0.6745909	1.4824
	UNITED KINGDOM	POUND	1.6934801	0.5905	1.6934801	0.5905	1.6164072	0.6187
For Month Ended 11/30/2009	DENMARK	KRONE	0.1715178	5.8303	0.1715178	5.8303	0.2014705	4.9635
	EUROPEAN UNION	EURO	1.2924906	0.7737	1.2924906	0.7737	1.4993482	0.667

	ICELAND	KRONA	0.0113496	88.1091	0.0113496	88.1091	0.0081553	122.619
	JAPAN	YEN	0.0091746	108.9969	0.0091746	108.9969	0.0116098	86.1343
	NORWAY	KRONE	0.1577063	6.3409	0.1577063	6.3409	0.1756189	5.6941
	SINGAPORE	DOLLAR	0.6593696	1.5166	0.6593696	1.5166	0.7221304	1.3848
	SOUTH KOREA	WON	0.0008392	1191.571	0.0008392	1191.571	0.0008592	1163.8187
	TURKEY	LIRA	0.7203054	1.3883	0.7203054	1.3883	0.6521497	1.5334
	UNITED KINGDOM	POUND	1.6934801	0.5905	1.6934801	0.5905	1.6405992	0.6095
For Month Ended 10/31/2009	DENMARK	KRONE	0.1715178	5.8303	0.1715178	5.8303	0.1988429	5.0291
	EUROPEAN UNION	EURO	1.2924906	0.7737	1.2924906	0.7737	1.48	0.6757
	ICELAND	KRONA	0.0113496	88.1091	0.0113496	88.1091	0.0080444	124.3099
	JAPAN	YEN	0.0091746	108.9969	0.0091746	108.9969	0.0111012	90.08
	NORWAY	KRONE	0.1577063	6.3409	0.1577063	6.3409	0.1743922	5.7342
	SINGAPORE	DOLLAR	0.6593696	1.5166	0.6593696	1.5166	0.7159216	1.3968
	SOUTH KOREA	WON	0.0008392	1191.571	0.0008392	1191.571	0.000843	1186.2
	TURKEY	LIRA	0.7203054	1.3883	0.7203054	1.3883	0.6638784	1.5063
	UNITED KINGDOM	POUND	1.6934801	0.5905	1.6934801	0.5905	1.6520071	0.6053
For Month Ended 9/30/2009	DENMARK	KRONE	0.1682227	5.9445	0.1682227	5.9445	0.1965184	5.0886
	EUROPEAN UNION	EURO	1.2650221	0.7905	1.2650221	0.7905	1.4631565	0.6835
	ICELAND	KRONA	0.0143772	69.5546	0.0143772	69.5546	0.0080785	123.7852
	JAPAN	YEN	0.0087489	114.3007	0.0087489	114.3007	0.0111728	89.5033
	NORWAY	KRONE	0.1552096	6.4429	0.1552096	6.4429	0.1730268	5.7795
	SINGAPORE	DOLLAR	0.6349609	1.5749	0.6349609	1.5749	0.7098234	1.4088
	SOUTH KOREA	WON	0.0010193	981.0592	0.0010193	981.0592	0.00085	1176.4226
	TURKEY	LIRA	0.6979828	1.4327	0.6979828	1.4327	0.673456	1.4849
	UNITED KINGDOM	POUND	1.8031013	0.5546	1.8031013	0.5546	1.6004	0.6248
For Month Ended 8/31/2009	DENMARK	KRONE	0.1682227	5.9445	0.1682227	5.9445	0.1928979	5.1841
	EUROPEAN UNION	EURO	1.2650221	0.7905	1.2650221	0.7905	1.4350007	0.6969
	ICELAND	KRONA	0.0143772	69.5546	0.0143772	69.5546	0.0079956	125.0686
	JAPAN	YEN	0.0087489	114.3007	0.0087489	114.3007	0.0107286	93.2089
	NORWAY	KRONE	0.1552096	6.4429	0.1552096	6.4429	0.1664899	6.0064
	SINGAPORE	DOLLAR	0.6349609	1.5749	0.6349609	1.5749	0.6937731	1.4414
	SOUTH KOREA	WON	0.0010193	981.0592	0.0010193	981.0592	0.0008004	1249.3541
	TURKEY	LIRA	0.6979828	1.4327	0.6979828	1.4327	0.6670591	1.4991
	UNITED KINGDOM	POUND	1.8031013	0.5546	1.8031013	0.5546	1.6301144	0.6135
For Month Ended 7/31/2009	DENMARK	KRONE	0.1682227	5.9445	0.1682227	5.9445	0.1915754	5.2199
	EUROPEAN UNION	EURO	1.2650221	0.7905	1.2650221	0.7905	1.4264836	0.701
	ICELAND	KRONA	0.0143772	69.5546	0.0143772	69.5546	0.0079031	126.5329
	JAPAN	YEN	0.0087489	114.3007	0.0087489	114.3007	0.0105755	94.5585
	NORWAY	KRONE	0.1552096	6.4429	0.1552096	6.4429	0.1632883	6.1241
	SINGAPORE	DOLLAR	0.6349609	1.5749	0.6349609	1.5749	0.6947548	1.4394
	SOUTH KOREA	WON	0.0010193	981.0592	0.0010193	981.0592	0.0008178	1222.75

	TURKEY	LIRA	0.6979828	1.4327	0.6979828	1.4327	0.6786848	1.4734
	UNITED KINGDOM	POUND	1.8031013	0.5546	1.8031013	0.5546	1.6706114	0.5986
For Month Ended 6/30/2009	DENMARK	KRONE	0.1682227	5.9445	0.1682227	5.9445	0.1882691	5.3115
	EUROPEAN UNION	EURO	1.2650221	0.7905	1.2650221	0.7905	1.4019222	0.7133
	ICELAND	KRONA	0.0143772	69.5546	0.0143772	69.5546	0.0078333	127.66
	JAPAN	YEN	0.0087489	114.3007	0.0087489	114.3007	0.0103711	96.4222
	NORWAY	KRONE	0.1552096	6.4429	0.1552096	6.4429	0.1553087	6.4388
	SINGAPORE	DOLLAR	0.6349609	1.5749	0.6349609	1.5749	0.6907132	1.4478
	SOUTH KOREA	WON	0.0010193	981.0592	0.0010193	981.0592	0.000784	1275.5068
	TURKEY	LIRA	0.6979828	1.4327	0.6979828	1.4327	0.6491444	1.5405
	UNITED KINGDOM	POUND	1.8031013	0.5546	1.8031013	0.5546	1.6449409	0.6079
For Month Ended 5/31/2009	DENMARK	KRONE	0.1682227	5.9445	0.1682227	5.9445	0.1897065	5.2713
	EUROPEAN UNION	EURO	1.2650221	0.7905	1.2650221	0.7905	1.4136573	0.7074
	ICELAND	KRONA	0.0143772	69.5546	0.0143772	69.5546	0.0082173	121.695
	JAPAN	YEN	0.0087489	114.3007	0.0087489	114.3007	0.010475	95.4653
	NORWAY	KRONE	0.1552096	6.4429	0.1552096	6.4429	0.1583005	6.3171
	SINGAPORE	DOLLAR	0.6349609	1.5749	0.6349609	1.5749	0.69266	1.4437
	SOUTH KOREA	WON	0.0010193	981.0592	0.0010193	981.0592	0.0007982	1252.85
	TURKEY	LIRA	0.6979828	1.4327	0.6979828	1.4327	0.6488451	1.5412
	UNITED KINGDOM	POUND	1.8031013	0.5546	1.8031013	0.5546	1.6157699	0.6189
For Month Ended 4/30/2009	DENMARK	KRONE	0.1682227	5.9445	0.1682227	5.9445	0.1778821	5.6217
	EUROPEAN UNION	EURO	1.2650221	0.7905	1.2650221	0.7905	1.3249403	0.7548
	ICELAND	KRONA	0.0143772	69.5546	0.0143772	69.5546	0.0078371	127.5978
	JAPAN	YEN	0.0087489	114.3007	0.0087489	114.3007	0.0101249	98.7665
	NORWAY	KRONE	0.1552096	6.4429	0.1552096	6.4429	0.1522425	6.5685
	SINGAPORE	DOLLAR	0.6349609	1.5749	0.6349609	1.5749	0.676917	1.4773
	SOUTH KOREA	WON	0.0010193	981.0592	0.0010193	981.0592	0.0007824	1278.146
	TURKEY	LIRA	0.6979828	1.4327	0.6979828	1.4327	0.6263576	1.5965
	UNITED KINGDOM	POUND	1.8031013	0.5546	1.8031013	0.5546	1.4808979	0.6753
For Month Ended 3/31/2009	DENMARK	KRONE	0.1682227	5.9445	0.1682227	5.9445	0.1780628	5.616
	EUROPEAN UNION	EURO	1.2650221	0.7905	1.2650221	0.7905	1.3259838	0.7542
	ICELAND	KRONA	0.0143772	69.5546	0.0143772	69.5546	0.008112	123.2743
	JAPAN	YEN	0.0087489	114.3007	0.0087489	114.3007	0.0100871	99.1362
	NORWAY	KRONE	0.1552096	6.4429	0.1552096	6.4429	0.148319	6.7422
	SINGAPORE	DOLLAR	0.6349609	1.5749	0.6349609	1.5749	0.6575707	1.5207
	SOUTH KOREA	WON	0.0010193	981.0592	0.0010193	981.0592	0.0007286	1372.5743
	TURKEY	LIRA	0.6979828	1.4327	0.6979828	1.4327	0.5994244	1.6683
	UNITED KINGDOM	POUND	1.8031013	0.5546	1.8031013	0.5546	1.4296416	0.6995
For Month Ended 2/28/2009	DENMARK	KRONE	0.1682227	5.9445	0.1682227	5.9445	0.1701462	5.8773
	EUROPEAN UNION	EURO	1.2650221	0.7905	1.2650221	0.7905	1.2677485	0.7888
	ICELAND	KRONA	0.0143772	69.5546	0.0143772	69.5546	0.0087951	113.7

	JAPAN	YEN	0.0087489	114.3007	0.0087489	114.3007	0.0102449	97.61
	NORWAY	KRONE	0.1552096	6.4429	0.1552096	6.4429	0.1422718	7.0288
	SINGAPORE	DOLLAR	0.6349609	1.5749	0.6349609	1.5749	0.645682	1.5487
	SOUTH KOREA	WON	0.0010193	981.0592	0.0010193	981.0592	0.000653	1531.45
	TURKEY	LIRA	0.6979828	1.4327	0.6979828	1.4327	0.5878553	1.7011
	UNITED KINGDOM	POUND	1.8031013	0.5546	1.8031013	0.5546	1.4275008	0.7005
For Month Ended 1/31/2009	DENMARK	KRONE	0.1682227	5.9445	0.1682227	5.9445	0.1718951	5.8175
	EUROPEAN UNION	EURO	1.2650221	0.7905	1.2650221	0.7905	1.2803032	0.7811
	ICELAND	KRONA	0.0143772	69.5546	0.0143772	69.5546	0.0087819	113.87
	JAPAN	YEN	0.0087489	114.3007	0.0087489	114.3007	0.0111219	89.913
	NORWAY	KRONE	0.1552096	6.4429	0.1552096	6.4429	0.1448499	6.9037
	SINGAPORE	DOLLAR	0.6349609	1.5749	0.6349609	1.5749	0.6620324	1.5105
	SOUTH KOREA	WON	0.0010193	981.0592	0.0010193	981.0592	0.000724	1381.2
	TURKEY	LIRA	0.6979828	1.4327	0.6979828	1.4327	0.6081616	1.6443
	UNITED KINGDOM	POUND	1.8031013	0.5546	1.8031013	0.5546	1.4597475	0.6851
For Month Ended 12/31/2008	DENMARK	KRONE	0.1682227	5.9445	0.1682227	5.9445	0.186929	5.3496
	EUROPEAN UNION	EURO	1.2650221	0.7905	1.2650221	0.7905	1.3920444	0.7184
	ICELAND	KRONA	0.0143772	69.5546	0.0143772	69.5546	0.0082333	121.4586
	JAPAN	YEN	0.0087489	114.3007	0.0087489	114.3007	0.0110152	90.7838
	NORWAY	KRONE	0.1552096	6.4429	0.1552096	6.4429	0.1433378	6.9765
	SINGAPORE	DOLLAR	0.6349609	1.5749	0.6349609	1.5749	0.6957334	1.4373
	SOUTH KOREA	WON	0.0010193	981.0592	0.0010193	981.0592	0.0007905	1264.9771
	TURKEY	LIRA	0.6979828	1.4327	0.6979828	1.4327	0.6493535	1.54
	UNITED KINGDOM	POUND	1.8031013	0.5546	1.8031013	0.5546	1.4615274	0.6842
For Month Ended 11/30/2008	DENMARK	KRONE	0.1682227	5.9445	0.1682227	5.9445	0.1703723	5.8695
	EUROPEAN UNION	EURO	1.2650221	0.7905	1.2650221	0.7905	1.268448	0.7884
	ICELAND	KRONA	0.0143772	69.5546	0.0143772	69.5546	0.0069979	142.9
	JAPAN	YEN	0.0087489	114.3007	0.0087489	114.3007	0.0104685	95.525
	NORWAY	KRONE	0.1552096	6.4429	0.1552096	6.4429	0.1427144	7.007
	SINGAPORE	DOLLAR	0.6349609	1.5749	0.6349609	1.5749	0.660701	1.5135
	SOUTH KOREA	WON	0.0010193	981.0592	0.0010193	981.0592	0.0006801	1470.3
	TURKEY	LIRA	0.6979828	1.4327	0.6979828	1.4327	0.6384881	1.5662
	UNITED KINGDOM	POUND	1.8031013	0.5546	1.8031013	0.5546	1.5342012	0.6518
For Month Ended 10/31/2008	DENMARK	KRONE	0.1682227	5.9445	0.1682227	5.9445	0.1702645	5.8732
	EUROPEAN UNION	EURO	1.2650221	0.7905	1.2650221	0.7905	1.2679542	0.7887
	ICELAND	KRONA	0.0143772	69.5546	0.0143772	69.5546	0.0082815	120.7507
	JAPAN	YEN	0.0087489	114.3007	0.0087489	114.3007	0.01016	98.4251
	NORWAY	KRONE	0.1552096	6.4429	0.1552096	6.4429	0.148375	6.7397
	SINGAPORE	DOLLAR	0.6349609	1.5749	0.6349609	1.5749	0.6739662	1.4838
	SOUTH KOREA	WON	0.0010193	981.0592	0.0010193	981.0592	0.0007768	1287.3906
	TURKEY	LIRA	0.6979828	1.4327	0.6979828	1.4327	0.652621	1.5323

	UNITED KINGDOM	POUND	1.8031013	0.5546	1.8031013	0.5546	1.6152532	0.6191
For Month Ended 9/30/2008	DENMARK	KRONE	0.1599411	6.2523	0.1599411	6.2523	0.1887631	5.2976
	EUROPEAN UNION	EURO	1.2108003	0.8259	12.1080034	0.0826	1.408156	0.7101
	ICELAND	KRONA	0.0134384	74.4138	0.0134384	74.4138	0.0094338	106.0017
	JAPAN	YEN	0.0087125	114.7781	0.0087125	114.7781	0.0094398	105.9349
	NORWAY	KRONE	0.1519133	6.5827	0.1519133	6.5827	0.1697755	5.8901
	SINGAPORE	DOLLAR	0.6172078	1.6202	0.6172078	1.6202	0.6975453	1.4336
	SOUTH KOREA	WON	0.0009749	1025.697	0.0009749	1025.697	0.0008284	1207.1237
	TURKEY	LIRA	0.6899883	1.4493	0.6899883	1.4493	0.7845599	1.2746
	UNITED KINGDOM	POUND	1.8089725	0.5528	1.8089725	0.5528	1.7801563	0.5617
For Month Ended 8/31/2008	DENMARK	KRONE	0.1599411	6.2523	0.1599411	6.2523	0.1966955	5.084
	EUROPEAN UNION	EURO	1.2108003	0.8259	12.1080034	0.0826	1.4667058	0.6818
	ICELAND	KRONA	0.0134384	74.4138	0.0134384	74.4138	0.0120041	83.305
	JAPAN	YEN	0.0087125	114.7781	0.0087125	114.7781	0.00919	108.814
	NORWAY	KRONE	0.1519133	6.5827	0.1519133	6.5827	0.1843318	5.425
	SINGAPORE	DOLLAR	0.6172078	1.6202	0.6172078	1.6202	0.7060152	1.4164
	SOUTH KOREA	WON	0.0009749	1025.697	0.0009749	1025.697	0.0009148	1093.15
	TURKEY	LIRA	0.6899883	1.4493	0.6899883	1.4493	0.8435615	1.1855
	UNITED KINGDOM	POUND	1.8089725	0.5528	1.8089725	0.5528	1.8189094	0.5498
For Month Ended 7/31/2008	DENMARK	KRONE	0.1599411	6.2523	0.1599411	6.2523	0.2089698	4.7854
	EUROPEAN UNION	EURO	1.2108003	0.8259	12.1080034	0.0826	1.5586285	0.6416
	ICELAND	KRONA	0.0134384	74.4138	0.0134384	74.4138	0.0126281	79.1884
	JAPAN	YEN	0.0087125	114.7781	0.0087125	114.7781	0.009251	108.0965
	NORWAY	KRONE	0.1519133	6.5827	0.1519133	6.5827	0.1948475	5.1322
	SINGAPORE	DOLLAR	0.6172078	1.6202	0.6172078	1.6202	0.7312892	1.3674
	SOUTH KOREA	WON	0.0009749	1025.697	0.0009749	1025.697	0.00099	1010.1004
	TURKEY	LIRA	0.6899883	1.4493	0.6899883	1.4493	0.8599913	1.1628
	UNITED KINGDOM	POUND	1.8089725	0.5528	1.8089725	0.5528	1.9800808	0.505
For Month Ended 6/30/2008	DENMARK	KRONE	0.1599411	6.2523	0.1599411	6.2523	0.2111397	4.7362
	EUROPEAN UNION	EURO	1.2108003	0.8259	12.1080034	0.0826	1.5748031	0.635
	ICELAND	KRONA	0.0134384	74.4138	0.0134384	74.4138	0.0126569	79.0086
	JAPAN	YEN	0.0087125	114.7781	0.0087125	114.7781	0.009417	106.191
	NORWAY	KRONE	0.1519133	6.5827	0.1519133	6.5827	0.1963776	5.0922
	SINGAPORE	DOLLAR	0.6172078	1.6202	0.6172078	1.6202	0.7348186	1.3609
	SOUTH KOREA	WON	0.0009749	1025.697	0.0009749	1025.697	0.0009551	1046.99
	TURKEY	LIRA	0.6899883	1.4493	0.6899883	1.4493	0.8179966	1.2225
	UNITED KINGDOM	POUND	1.8089725	0.5528	1.8089725	0.5528	1.9904459	0.5024
For Month Ended 5/31/2008	DENMARK	KRONE	0.1599411	6.2523	0.1599411	6.2523	0.2085223	4.7957
	EUROPEAN UNION	EURO	1.2108003	0.8259	12.1080034	0.0826	1.5540016	0.6435
	ICELAND	KRONA	0.0134384	74.4138	0.0134384	74.4138	0.0134523	74.3365
	JAPAN	YEN	0.0087125	114.7781	0.0087125	114.7781	0.0094769	105.52

	NORWAY	KRONE	0.1519133	6.5827	0.1519133	6.5827	0.1963942	5.0918
	SINGAPORE	DOLLAR	0.6172078	1.6202	0.6172078	1.6202	0.734484	1.3615
	SOUTH KOREA	WON	0.0009749	1025.697	0.0009749	1025.697	0.0009708	1030.05
	TURKEY	LIRA	0.6899883	1.4493	0.6899883	1.4493	0.8202773	1.2191
	UNITED KINGDOM	POUND	1.8089725	0.5528	1.8089725	0.5528	1.9791986	0.5053
	DENMARK	KRONE	0.1599411	6.2523	0.1599411	6.2523	0.2086436	4.7929
	EUROPEAN UNION	EURO	1.2108003	0.8259	12.1080034	0.0826	1.556424	0.6425
	ICELAND	KRONA	0.0134384	74.4138	0.0134384	74.4138	0.0133709	74.7895
For Month Ended 4/30/2008	JAPAN	YEN	0.0087125	114.7781	0.0087125	114.7781	0.0095666	104.5302
	NORWAY	KRONE	0.1519133	6.5827	0.1519133	6.5827	0.1953369	5.1194
	SINGAPORE	DOLLAR	0.6172078	1.6202	0.6172078	1.6202	0.7365964	1.3576
	SOUTH KOREA	WON	0.0009749	1025.697	0.0009749	1025.697	0.0009941	1005.9541
	TURKEY	LIRA	0.6899883	1.4493	0.6899883	1.4493	0.7842184	1.2752
	UNITED KINGDOM	POUND	1.8089725	0.5528	1.8089725	0.5528	1.984282	0.504
	DENMARK	KRONE	0.1599411	6.2523	0.1599411	6.2523	0.2119421	4.7183
	EUROPEAN UNION	EURO	1.2108003	0.8259	12.1080034	0.0826	1.580403	0.6328
	ICELAND	KRONA	0.0134384	74.4138	0.0134384	74.4138	0.0132258	75.6096
For Month Ended 3/31/2008	JAPAN	YEN	0.0087125	114.7781	0.0087125	114.7781	0.0100141	99.8595
	NORWAY	KRONE	0.1519133	6.5827	0.1519133	6.5827	0.1966344	5.0856
	SINGAPORE	DOLLAR	0.6172078	1.6202	0.6172078	1.6202	0.7251106	1.3791
	SOUTH KOREA	WON	0.0009749	1025.697	0.0009749	1025.697	0.0010098	990.3072
	TURKEY	LIRA	0.6899883	1.4493	0.6899883	1.4493	0.7514164	1.3308
	UNITED KINGDOM	POUND	1.8089725	0.5528	1.8089725	0.5528	1.9858843	0.5036
	DENMARK	KRONE	0.1599411	6.2523	0.1599411	6.2523	0.2038512	4.9055
	EUROPEAN UNION	EURO	1.2108003	0.8259	12.1080034	0.0826	1.5187528	0.6584
	ICELAND	KRONA	0.0134384	74.4138	0.0134384	74.4138	0.0151332	66.0799
For Month Ended 2/29/2008	JAPAN	YEN	0.0087125	114.7781	0.0087125	114.7781	0.0095963	104.2066
	NORWAY	KRONE	0.1519133	6.5827	0.1519133	6.5827	0.1919861	5.2087
	SINGAPORE	DOLLAR	0.6172078	1.6202	0.6172078	1.6202	0.7175248	1.3937
	SOUTH KOREA	WON	0.0009749	1025.697	0.0009749	1025.697	0.001065	938.9405
	TURKEY	LIRA	0.6899883	1.4493	0.6899883	1.4493	0.8281916	1.2075
	UNITED KINGDOM	POUND	1.8089725	0.5528	1.8089725	0.5528	1.9862196	0.5035
	DENMARK	KRONE	0.1599411	6.2523	0.1599411	6.2523	0.1990967	5.0227
	EUROPEAN UNION	EURO	1.2108003	0.8259	12.1080034	0.0826	1.483816	0.6739
	ICELAND	KRONA	0.0134384	74.4138	0.0134384	74.4138	0.0154064	64.9081
For Month Ended 1/31/2008	JAPAN	YEN	0.0087125	114.7781	0.0087125	114.7781	0.0093683	106.7433
	NORWAY	KRONE	0.1519133	6.5827	0.1519133	6.5827	0.1846422	5.4159
	SINGAPORE	DOLLAR	0.6172078	1.6202	0.6172078	1.6202	0.7059156	1.4166
	SOUTH KOREA	WON	0.0009749	1025.697	0.0009749	1025.697	0.0010596	943.7966
	TURKEY	LIRA	0.6899883	1.4493	0.6899883	1.4493	0.855037	1.1695
	UNITED KINGDOM	POUND	1.8089725	0.5528	1.8089725	0.5528	1.9894203	0.5027

For Month Ended 12/31/2007	DENMARK	KRONE	0.1599411	6.2523	0.1599411	6.2523	0.1958472	5.106
	EUROPEAN UNION	EURO	1.2108003	0.8259	12.1080034	0.0826	1.4600458	0.6849
	ICELAND	KRONA	0.0134384	74.4138	0.0134384	74.4138	0.015917	62.826
	JAPAN	YEN	0.0087125	114.7781	0.0087125	114.7781	0.008951	111.7188
	NORWAY	KRONE	0.1519133	6.5827	0.1519133	6.5827	0.1840236	5.4341
	SINGAPORE	DOLLAR	0.6172078	1.6202	0.6172078	1.6202	0.6958942	1.437
	SOUTH KOREA	WON	0.0009749	1025.697	0.0009749	1025.697	0.0010601	943.2651
	TURKEY	LIRA	0.6899883	1.4493	0.6899883	1.4493	0.8554759	1.1689
	UNITED KINGDOM	POUND	1.8089725	0.5528	1.8089725	0.5528	1.9856241	0.5036
For Month Ended 11/30/2007	DENMARK	KRONE	0.1599411	6.2523	0.1599411	6.2523	0.1962424	5.0957
	EUROPEAN UNION	EURO	1.2108003	0.8259	12.1080034	0.0826	1.462908	0.6836
	ICELAND	KRONA	0.0134384	74.4138	0.0134384	74.4138	0.0163239	61.26
	JAPAN	YEN	0.0087125	114.7781	0.0087125	114.7781	0.0089888	111.25
	NORWAY	KRONE	0.1519133	6.5827	0.1519133	6.5827	0.1799775	5.5563
	SINGAPORE	DOLLAR	0.6172078	1.6202	0.6172078	1.6202	0.6916543	1.4458
	SOUTH KOREA	WON	0.0009749	1025.697	0.0009749	1025.697	0.0010813	924.8263
	TURKEY	LIRA	0.6899883	1.4493	0.6899883	1.4493	0.8474576	1.18
	UNITED KINGDOM	POUND	1.8089725	0.5528	1.8089725	0.5528	2.0563438	0.4863
For Month Ended 10/31/2007	DENMARK	KRONE	0.1599411	6.2523	0.1599411	6.2523	0.1940881	5.1523
	EUROPEAN UNION	EURO	1.2108003	0.8259	1.2108003	0.8259	1.4461316	0.6915
	ICELAND	KRONA	0.0134384	74.4138	0.0134384	74.4138	0.0167221	59.8011
	JAPAN	YEN	0.0087125	114.7781	0.0087125	114.7781	0.0086733	115.2966
	NORWAY	KRONE	0.1519133	6.5827	0.1519133	6.5827	0.1854943	5.391
	SINGAPORE	DOLLAR	0.6172078	1.6202	0.6172078	1.6202	0.6903693	1.4485
	SOUTH KOREA	WON	0.0009749	1025.697	0.0009749	1025.697	0.0011101	900.8274
	TURKEY	LIRA	0.6899935	1.4493	0.6899935	1.4493	0.8545548	1.1702
	UNITED KINGDOM	POUND	1.8089725	0.5528	1.8089725	0.5528	2.0759809	0.4817
For Month Ended 9/30/2007	DENMARK	KRONE	0.1545356	6.471	0.1545356	6.471	0.1914352	5.2237
	EUROPEAN UNION	EURO	1.1723329	0.853	1.1723329	0.853	1.4234875	0.7025
	ICELAND	KRONA	0.0135002	74.073	0.0135002	74.073	0.0162008	61.7255
	JAPAN	YEN	0.0088261	113.3	0.0088261	113.3	0.0087108	114.8
	NORWAY	KRONE	0.1477541	6.768	0.1477541	6.768	0.1855184	5.3903
	SINGAPORE	DOLLAR	0.5868545	1.704	0.5868545	1.704	0.673174	1.4855
	SOUTH KOREA	WON	0.0008688	1151	0.0008688	1151	0.0010965	911.965
	TURKEY	LIRA	0.6703235	1.4918	0.6703235	1.4918	0.8268563	1.2094
	UNITED KINGDOM	POUND	1.7391304	0.575	1.7391304	0.575	2.038736	0.4905
For Month Ended 8/31/2007	DENMARK	KRONE	0.1545356	6.471	0.1545356	6.471	0.1830999	5.4615
	EUROPEAN UNION	EURO	1.1723329	0.853	1.1723329	0.853	1.3642006	0.733
	ICELAND	KRONA	0.0135002	74.073	0.0135002	74.073	0.015748	63.5003
	JAPAN	YEN	0.0088261	113.3	0.0088261	113.3	0.0086326	115.8402
	NORWAY	KRONE	0.1477541	6.768	0.1477541	6.768	0.17178	5.8214

	SINGAPORE	DOLLAR	0.5868545	1.704	0.5868545	1.704	0.6559958	1.5244
	SOUTH KOREA	WON	0.0008688	1151	0.0008688	1151	0.0010657	938.3097
	TURKEY	LIRA	0.6703235	1.4918	0.6703235	1.4918	0.7694675	1.2996
	UNITED KINGDOM	POUND	1.7391304	0.575	1.7391304	0.575	2.0165356	0.4959
For Month Ended 7/31/2007	DENMARK	KRONE	0.1545356	6.471	0.1545356	6.471	0.1842265	5.4281
	EUROPEAN UNION	EURO	1.1723329	0.853	1.1723329	0.853	1.3708019	0.7295
	ICELAND	KRONA	0.0135002	74.073	0.0135002	74.073	0.0163697	61.0884
	JAPAN	YEN	0.0088261	113.3	0.0088261	113.3	0.0083925	119.1535
	NORWAY	KRONE	0.1477541	6.768	0.1477541	6.768	0.1720697	5.8116
	SINGAPORE	DOLLAR	0.5868545	1.704	0.5868545	1.704	0.6597176	1.5158
	SOUTH KOREA	WON	0.0008688	1151	0.0008688	1151	0.0010879	919.1949
	TURKEY	LIRA	0.6703235	1.4918	0.6703235	1.4918	0.7857311	1.2727
	UNITED KINGDOM	POUND	1.7391304	0.575	1.7391304	0.575	2.0358306	0.4912
For Month Ended 6/30/2007	DENMARK	KRONE	0.1545356	6.471	0.1545356	6.471	0.1819902	5.4948
	EUROPEAN UNION	EURO	1.1723329	0.853	1.1723329	0.853	1.3540961	0.7385
	ICELAND	KRONA	0.0135002	74.073	0.0135002	74.073	0.0160669	62.2399
	JAPAN	YEN	0.0088261	113.3	0.0088261	113.3	0.0081189	123.17
	NORWAY	KRONE	0.1477541	6.768	0.1477541	6.768	0.1697937	5.8895
	SINGAPORE	DOLLAR	0.5868545	1.704	0.5868545	1.704	0.6527628	1.532
	SOUTH KOREA	WON	0.0008688	1151	0.0008688	1151	0.0010844	922.195
	TURKEY	LIRA	0.6703235	1.4918	0.6703235	1.4918	0.7641755	1.3086
	UNITED KINGDOM	POUND	1.7391304	0.575	1.7391304	0.575	2.0081128	0.498
For Month Ended 5/31/2007	DENMARK	KRONE	0.1545356	6.471	0.1545356	6.471	0.1806228	5.5364
	EUROPEAN UNION	EURO	1.1723329	0.853	1.1723329	0.853	1.3449899	0.7435
	ICELAND	KRONA	0.0135002	74.073	0.0135002	74.073	0.0162605	61.4989
	JAPAN	YEN	0.0088261	113.3	0.0088261	113.3	0.0082149	121.7307
	NORWAY	KRONE	0.1477541	6.768	0.1477541	6.768	0.1655766	6.0395
	SINGAPORE	DOLLAR	0.5868545	1.704	0.5868545	1.704	0.6532105	1.5309
	SOUTH KOREA	WON	0.0008688	1151	0.0008688	1151	0.0010777	927.87
	TURKEY	LIRA	0.6703235	1.4918	0.6703235	1.4918	0.7590709	1.3174
	UNITED KINGDOM	POUND	1.7391304	0.575	1.7391304	0.575	1.979806	0.5051
For Month Ended 4/30/2007	DENMARK	KRONE	0.1545356	6.471	0.1545356	6.471	0.1828856	5.4679
	EUROPEAN UNION	EURO	1.1723329	0.853	1.1723329	0.853	1.3635124	0.7334
	ICELAND	KRONA	0.0135002	74.073	0.0135002	74.073	0.0155788	64.19
	JAPAN	YEN	0.0088261	113.3	0.0088261	113.3	0.0083612	119.5998
	NORWAY	KRONE	0.1477541	6.768	0.1477541	6.768	0.1675435	5.9686
	SINGAPORE	DOLLAR	0.5868545	1.704	0.5868545	1.704	0.6585446	1.5185
	SOUTH KOREA	WON	0.0008688	1151	0.0008688	1151	0.0010762	929.1641
	TURKEY	LIRA	0.6703235	1.4918	0.6703235	1.4918	0.749232	1.3347
	UNITED KINGDOM	POUND	1.7391304	0.575	1.7391304	0.575	1.9984013	0.5004
For Month	DENMARK	KRONE	0.1545356	6.471	0.1545356	6.471	0.1792179	5.5798

Ended 3/31/2007	EUROPEAN UNION	EURO	1.1723329	0.853	1.1723329	0.853	1.3354701	0.7488
	ICELAND	KRONA	0.0135002	74.073	0.0135002	74.073	0.015186	65.8501
	JAPAN	YEN	0.0088261	113.3	0.0088261	113.3	0.0084897	117.79
	NORWAY	KRONE	0.1477541	6.768	0.1477541	6.768	0.1641147	6.0933
	SINGAPORE	DOLLAR	0.5868545	1.704	0.5868545	1.704	0.6592392	1.5169
	SOUTH KOREA	WON	0.0008688	1151	0.0008688	1151	0.0010269	973.8
	TURKEY	LIRA	0.6703235	1.4918	0.6703235	1.4918	0.7182876	1.3922
	UNITED KINGDOM	POUND	1.7391304	0.575	1.7391304	0.575	1.9681165	0.5081
For Month Ended 2/28/2007	DENMARK	KRONE	0.1545356	6.471	0.1545356	6.471	0.177535	5.6327
	EUROPEAN UNION	EURO	1.1723329	0.853	1.1723329	0.853	1.3227569	0.756
	ICELAND	KRONA	0.0135002	74.073	0.0135002	74.073	0.0151194	66.14
	JAPAN	YEN	0.0088261	113.3	0.0088261	113.3	0.0084515	118.3224
	NORWAY	KRONE	0.1477541	6.768	0.1477541	6.768	0.1630425	6.1334
	SINGAPORE	DOLLAR	0.5868545	1.704	0.5868545	1.704	0.6543044	1.5283
	SOUTH KOREA	WON	0.0008688	1151	0.0008688	1151	0.0010619	941.7103
	TURKEY	LIRA	0.6703235	1.4918	0.6703235	1.4918	0.7067091	1.415
	UNITED KINGDOM	POUND	1.7391304	0.575	1.7391304	0.575	1.960875	0.51
For Month Ended 1/31/2007	DENMARK	KRONE	0.1545356	6.471	0.1545356	6.471	0.1748007	5.7208
	EUROPEAN UNION	EURO	1.1723329	0.853	1.1723329	0.853	1.3034411	0.7672
	ICELAND	KRONA	0.0135002	74.073	0.0135002	74.073	0.0146285	68.3599
	JAPAN	YEN	0.0088261	113.3	0.0088261	113.3	0.0082871	120.67
	NORWAY	KRONE	0.1477541	6.768	0.1477541	6.768	0.1607149	6.2222
	SINGAPORE	DOLLAR	0.5868545	1.704	0.5868545	1.704	0.6512113	1.5356
	SOUTH KOREA	WON	0.0008688	1151	0.0008688	1151	0.0010621	941.53
	TURKEY	LIRA	0.6703235	1.4918	0.6703235	1.4918	0.7109847	1.4065
	UNITED KINGDOM	POUND	1.7391304	0.575	1.7391304	0.575	1.9646365	0.509
For Month Ended 12/31/2006	DENMARK	KRONE	0.1545356	6.471	0.1545356	6.471	0.177057	5.6479
	EUROPEAN UNION	EURO	1.1723329	0.853	1.1723329	0.853	1.3197	0.7577
	ICELAND	KRONA	0.0135002	74.073	0.0135002	74.073	0.0140905	70.97
	JAPAN	YEN	0.0088261	113.3	0.0088261	113.3	0.0084019	119.02
	NORWAY	KRONE	0.1477541	6.768	0.1477541	6.768	0.1605471	6.2287
	SINGAPORE	DOLLAR	0.5868545	1.704	0.5868545	1.704	0.6519755	1.5338
	SOUTH KOREA	WON	0.0008688	1151	0.0008688	1151	0.0010753	930
	TURKEY	LIRA	0.6703235	1.4918	0.6703235	1.4918	0.7055591	1.4173
	UNITED KINGDOM	POUND	1.7391304	0.575	1.7391304	0.575	1.9585991	0.5106
For Month Ended 11/30/2006	DENMARK	KRONE	0.1545356	6.471	0.1545356	6.471	0.1766972	5.6594
	EUROPEAN UNION	EURO	1.1723329	0.853	1.1723329	0.853	1.3199996	0.7576
	ICELAND	KRONA	0.0135002	74.073	0.0135002	74.073	0.014497	68.9799
	JAPAN	YEN	0.0088261	113.3	0.0088261	113.3	0.0085911	116.4002
	NORWAY	KRONE	0.1477541	6.768	0.1477541	6.768	0.1596263	6.2646
	SINGAPORE	DOLLAR	0.5868545	1.704	0.5868545	1.704	0.6475392	1.5443

	SOUTH KOREA	WON	0.0008688	1151	0.0008688	1151	0.0010752	930.0206
	TURKEY	LIRA	0.6703235	1.4918	0.6703235	1.4918	0.6882787	1.4529
	UNITED KINGDOM	POUND	1.7391304	0.575	1.7391304	0.575	1.9562045	0.5112
For Month Ended 10/31/2006	DENMARK	KRONE	0.1545356	6.471	0.1545356	6.471	0.1712739	5.8386
	EUROPEAN UNION	EURO	1.1723329	0.853	1.1723329	0.853	1.2764871	0.7834
	ICELAND	KRONA	0.0135002	74.073	0.0135002	74.073	0.0148017	67.56
	JAPAN	YEN	0.0088261	113.3	0.0088261	113.3	0.0085551	116.8899
	NORWAY	KRONE	0.1477541	6.768	0.1477541	6.768	0.152952	6.538
	SINGAPORE	DOLLAR	0.5868545	1.704	0.5868545	1.704	0.6424671	1.5565
	SOUTH KOREA	WON	0.0008688	1151	0.0008688	1151	0.0010674	936.8301
	TURKEY	LIRA	0.6703235	1.4918	0.6703235	1.4918	0.6877579	1.454
	UNITED KINGDOM	POUND	1.7391304	0.575	1.7391304	0.575	1.907305	0.5243
For Month Ended 9/30/2006	DENMARK	KRONE	0.1661958	6.017	0.1661958	6.017	0.1701838	5.876
	EUROPEAN UNION	EURO	1.1383039	0.8785	1.1383039	0.8785	1.2687135	0.7882
	ICELAND	KRONA	0.0121656	82.199	0.0121656	82.199	0.0142796	70.0299
	JAPAN	YEN	0.0086957	115	0.0086957	115	0.0084758	117.983
	NORWAY	KRONE	0.1481262	6.751	0.1481262	6.751	0.1537043	6.506
	SINGAPORE	DOLLAR	0.5743825	1.741	0.5743825	1.741	0.6307556	1.5854
	SOUTH KOREA	WON	0.0008297	1205.2	0.0008297	1205.2	0.0010568	946.2907
	TURKEY	LIRA	0.6603157	1.5144	0.6603157	1.5144	0.663482	1.5072
	UNITED KINGDOM	POUND	1.6863406	0.593	1.6863406	0.593	1.8716077	0.5343
For Month Ended 8/31/2006	DENMARK	KRONE	0.1661958	6.017	0.1661958	6.017	0.1722801	5.8045
	EUROPEAN UNION	EURO	1.1383039	0.8785	1.1383039	0.8785	1.2851819	0.7781
	ICELAND	KRONA	0.0121656	82.199	0.0121656	82.199	0.0144927	69.0001
	JAPAN	YEN	0.0086957	115	0.0086957	115	0.0085237	117.3205
	NORWAY	KRONE	0.1481262	6.751	0.1481262	6.751	0.1590558	6.2871
	SINGAPORE	DOLLAR	0.5743825	1.741	0.5743825	1.741	0.6357683	1.5729
	SOUTH KOREA	WON	0.0008297	1205.2	0.0008297	1205.2	0.0010421	959.6041
	TURKEY	LIRA	0.6603157	1.5144	0.6603157	1.5144	0.6824541	1.4653
	UNITED KINGDOM	POUND	1.6863406	0.593	1.6863406	0.593	1.9076688	0.5242
For Month Ended 7/31/2006	DENMARK	KRONE	0.1661958	6.017	0.1661958	6.017	0.1712006	5.8411
	EUROPEAN UNION	EURO	1.1383039	0.8785	1.1383039	0.8785	1.2774655	0.7828
	ICELAND	KRONA	0.0121656	82.199	0.0121656	82.199	0.0139919	71.4701
	JAPAN	YEN	0.0086957	115	0.0086957	115	0.0087222	114.65
	NORWAY	KRONE	0.1481262	6.751	0.1481262	6.751	0.1625012	6.1538
	SINGAPORE	DOLLAR	0.5743825	1.741	0.5743825	1.741	0.6333924	1.5788
	SOUTH KOREA	WON	0.0008297	1205.2	0.0008297	1205.2	0.0010469	955.2
	TURKEY	LIRA	0.6603157	1.5144	0.6603157	1.5144	0.667735	1.4976
	UNITED KINGDOM	POUND	1.6863406	0.593	1.6863406	0.593	1.8681113	0.5353
For Month Ended 6/30/2006	DENMARK	KRONE	0.1661958	6.017	0.1661958	6.017	0.1704332	5.8674
	EUROPEAN UNION	EURO	1.1383039	0.8785	1.1383039	0.8785	1.2712942	0.7866

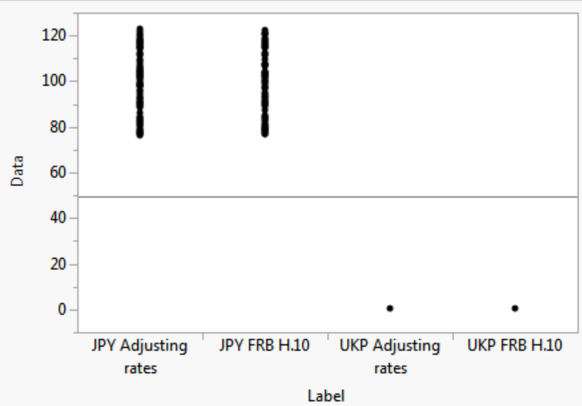
	ICELAND	KRONA	0.0121656	82.199	0.0121656	82.199	0.0131627	75.9722
	JAPAN	YEN	0.0086957	115	0.0086957	115	0.0086994	114.9503
	NORWAY	KRONE	0.1481262	6.751	0.1481262	6.751	0.1601948	6.2424
	SINGAPORE	DOLLAR	0.5743825	1.741	0.5743825	1.741	0.6291682	1.5894
	SOUTH KOREA	WON	0.0008297	1205.2	0.0008297	1205.2	0.0010413	960.3007
	TURKEY	LIRA	0.6603157	1.5144	0.6603157	1.5144	0.6355259	1.5735
	UNITED KINGDOM	POUND	1.6863406	0.593	1.6863406	0.593	1.8345258	0.5451
For Month Ended 5/31/2006	DENMARK	KRONE	0.1661958	6.017	0.1661958	6.017	0.1718006	5.8207
	EUROPEAN UNION	EURO	1.1383039	0.8785	1.1383039	0.8785	1.2815584	0.7803
	ICELAND	KRONA	0.0121656	82.199	0.0121656	82.199	0.0139471	71.6996
	JAPAN	YEN	0.0086957	115	0.0086957	115	0.0088857	112.54
	NORWAY	KRONE	0.1481262	6.751	0.1481262	6.751	0.1645007	6.079
	SINGAPORE	DOLLAR	0.5743825	1.741	0.5743825	1.741	0.6333924	1.5788
	SOUTH KOREA	WON	0.0008297	1205.2	0.0008297	1205.2	0.0010574	945.72
	TURKEY	LIRA	0.6603157	1.5144	0.6603157	1.5144	0.6355259	1.5735
	UNITED KINGDOM	POUND	1.6863406	0.593	1.6863406	0.593	1.8702076	0.5347
For Month Ended 4/30/2006	DENMARK	KRONE	0.1661958	6.017	0.1661958	6.017	0.168039	5.951
	EUROPEAN UNION	EURO	1.1383039	0.8785	1.1383039	0.8785	1.2537613	0.7976
	ICELAND	KRONA	0.0121656	82.199	0.0121656	82.199	0.0133832	74.7203
	JAPAN	YEN	0.0086957	115	0.0086957	115	0.0087489	114.2999
	NORWAY	KRONE	0.1481262	6.751	0.1481262	6.751	0.1616214	6.1873
	SINGAPORE	DOLLAR	0.5743825	1.741	0.5743825	1.741	0.631672	1.5831
	SOUTH KOREA	WON	0.0008297	1205.2	0.0008297	1205.2	0.0010574	945.699
	TURKEY	LIRA	0.6603157	1.5144	0.6603157	1.5144	0.7532957	1.3275
	UNITED KINGDOM	POUND	1.6863406	0.593	1.6863406	0.593	1.8086453	0.5529
For Month Ended 3/31/2006	DENMARK	KRONE	0.1661958	6.017	0.1661958	6.017	0.1623008	6.1614
	EUROPEAN UNION	EURO	1.1383039	0.8785	1.1383039	0.8785	1.211387	0.8255
	ICELAND	KRONA	0.0121656	82.199	0.0121656	82.199	0.0139782	71.5398
	JAPAN	YEN	0.0086957	115	0.0086957	115	0.0084913	117.768
	NORWAY	KRONE	0.1481262	6.751	0.1481262	6.751	0.1525902	6.5535
	SINGAPORE	DOLLAR	0.5743825	1.741	0.5743825	1.741	0.6187736	1.6161
	SOUTH KOREA	WON	0.0008297	1205.2	0.0008297	1205.2	0.0010241	976.4376
	TURKEY	LIRA	0.6603157	1.5144	0.6603157	1.5144	0.7448235	1.3426
	UNITED KINGDOM	POUND	1.6863406	0.593	1.6863406	0.593	1.7367141	0.5758
For Month Ended 2/28/2006	DENMARK	KRONE	0.1661958	6.017	0.1661958	6.017	0.1598006	6.2578
	EUROPEAN UNION	EURO	1.1383039	0.8785	1.1383039	0.8785	1.1924636	0.8386
	ICELAND	KRONA	0.0121656	82.199	0.0121656	82.199	0.0153539	65.1301
	JAPAN	YEN	0.0086957	115	0.0086957	115	0.0086341	115.82
	NORWAY	KRONE	0.1481262	6.751	0.1481262	6.751	0.1482008	6.7476
	SINGAPORE	DOLLAR	0.5743825	1.741	0.5743825	1.741	0.6162948	1.6226
	SOUTH KOREA	WON	0.0008297	1205.2	0.0008297	1205.2	0.0010299	970.97

	TURKEY	LIRA	0.6603157	1.5144	0.6603157	1.5144	0.761035	1.314
	UNITED KINGDOM	POUND	1.6863406	0.593	1.6863406	0.593	1.7540782	0.5701
For Month Ended 1/31/2006	DENMARK	KRONE	0.1661958	6.017	0.1661958	6.017	0.1623561	6.1593
	EUROPEAN UNION	EURO	1.1383039	0.8785	1.1383039	0.8785	1.2118274	0.8252
	ICELAND	KRONA	0.0121656	82.199	0.0121656	82.199	0.0160179	62.43
	JAPAN	YEN	0.0086957	115	0.0086957	115	0.0084955	117.71
	NORWAY	KRONE	0.1481262	6.751	0.1481262	6.751	0.149158	6.7043
	SINGAPORE	DOLLAR	0.5743825	1.741	0.5743825	1.741	0.6033547	1.6574
	SOUTH KOREA	WON	0.0008297	1205.2	0.0008297	1205.2	0.0010299	970.9977
	TURKEY	LIRA	0.6603157	1.5144	0.6603157	1.5144	0.7527853	1.3284
	UNITED KINGDOM	POUND	1.6863406	0.593	1.6863406	0.593	1.7711654	0.5646
For Month Ended 12/31/2005	DENMARK	KRONE	0.1661958	6.017	0.1661958	6.017	0.1589926	6.2896
	EUROPEAN UNION	EURO	1.1383039	0.8785	1.1383039	0.8785	1.1875074	0.8421
	ICELAND	KRONA	0.0121656	82.199	0.0121656	82.199	0.0159261	62.7899
	JAPAN	YEN	0.0086957	115	0.0086957	115	0.0084964	117.6967
	NORWAY	KRONE	0.1481262	6.751	0.1481262	6.751	0.149158	6.7043
	SINGAPORE	DOLLAR	0.5743825	1.741	0.5743825	1.741	0.6033547	1.6574
	SOUTH KOREA	WON	0.0008297	1205.2	0.0008297	1205.2	0.0009912	1008.9
	TURKEY	LIRA	0.6603157	1.5144	0.6603157	1.5144	0.7446016	1.343
	UNITED KINGDOM	POUND	1.6863406	0.593	1.6863406	0.593	1.7295054	0.5782
For Month Ended 11/30/2005	DENMARK	KRONE	0.1661958	6.017	0.1661958	6.017	0.1582003	6.3211
	EUROPEAN UNION	EURO	1.1383039	0.8785	1.1383039	0.8785	1.1791062	0.8481
	ICELAND	KRONA	0.0121656	82.199	0.0121656	82.199	0.0157084	63.6603
	JAPAN	YEN	0.0086957	115	0.0086957	115	0.0083459	119.82
	NORWAY	KRONE	0.1481262	6.751	0.1481262	6.751	0.148401	6.7385
	SINGAPORE	DOLLAR	0.5743825	1.741	0.5743825	1.741	0.5912961	1.6912
	SOUTH KOREA	WON	0.0008297	1205.2	0.0008297	1205.2	0.0009639	1037.45
	TURKEY	LIRA	0.6603157	1.5144	0.6603157	1.5144	0.7371913	1.3565
	UNITED KINGDOM	POUND	1.6863406	0.593	1.6863406	0.593	1.7295054	0.5782
For Month Ended 10/31/2005	DENMARK	KRONE	0.1661958	6.017	0.1661958	6.017	0.1605987	6.2267
	EUROPEAN UNION	EURO	1.1383039	0.8785	1.1383039	0.8785	1.198466	0.8344
	ICELAND	KRONA	0.0121656	82.199	0.0121656	82.199	0.0163801	61.0499
	JAPAN	YEN	0.0086957	115	0.0086957	115	0.0085911	116.4
	NORWAY	KRONE	0.1481262	6.751	0.1481262	6.751	0.1536995	6.5062
	SINGAPORE	DOLLAR	0.5743825	1.741	0.5743825	1.741	0.5903885	1.6938
	SOUTH KOREA	WON	0.0008297	1205.2	0.0008297	1205.2	0.0009579	1043.95
	TURKEY	LIRA	0.6603157	1.5144	0.6603157	1.5144	0.7399186	1.3515
	UNITED KINGDOM	POUND	1.6863406	0.593	1.6863406	0.593	1.7702248	0.5649

Appendix F: Comparison of FRB H.10 and DoD Adjusting Rates

The FRB H.10 average monthly Pound and Yen exchange rates are not statistically different as their respective DoD adjusting rates. The exchange rates from both sources do not exhibit a normal distribution; therefore a nonparametric comparison was completed using the Wilcoxon method. The p-value of both pairs of currencies is extremely higher than 0.05, indicating the samples come from the same population (as shown by the top two pair comparisons below). This allows the use of the FRB H.10 data for method comparison in the long term analysis.

Oneway Analysis of Data By Label



Nonparametric Comparisons For Each Pair Using Wilcoxon Method

q*	Alpha
1.95996	0.05

Level	- Level	Score Mean Difference	Std Err Dif	Z	p-Value	Hodges-Lehmann	Lower CL	Upper CL
UKP FRB H.10	UKP Adjusting rates	1.037	8.504761	0.1219	0.9029	0.0005719	-0.011	0.0125
JPY FRB H.10	JPY Adjusting rates	-0.037	8.504878	-0.0044	0.9965	-0.0290	-3.457	3.3705
UKP Adjusting rates	JPY Adjusting rates	-107.991	8.504746	-12.6977	<.0001*	-97.1749	-100.766	-94.0343
UKP Adjusting rates	JPY FRB H.10	-107.991	8.504766	-12.6977	<.0001*	-97.1970	-100.295	-93.7750
UKP FRB H.10	JPY Adjusting rates	-107.991	8.504878	-12.6975	<.0001*	-97.1715	-100.763	-94.0305
UKP FRB H.10	JPY FRB H.10	-107.991	8.504898	-12.6975	<.0001*	-97.1969	-100.292	-93.7756

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14. ABSTRACT This thesis examines the current method of forecasting foreign currency exchange rates for the annual US Air Force budget. Using 5 methods against the status quo of a center-weighted average, the paper evaluates the absolute percent error (APE) over three time periods extending from Fiscal Year (FY) 1979 to FY 2014. The results strongly indicate that four of the alternative methods outperform over the short term, and one method for all three time periods. Furthermore, a non-parametric comparison of the median APE demonstrates statistical similarities between the four methods over the short term, and allows for the Air Force to choose which method to exercise for future forecasting. Overall, the paper recommends using a private firm's forecasts to decrease the median APE by 3.36% and avoiding $36.1 million opportunity cost.		
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